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THE PRESENT CONDITION OF CANADIAN CONCHOLOGY.

By REV. GEO. W. TAYLOR, F.R.S.C.

I am afraid that the title of my paper will hardly be justified by the paper itself, for to write fully and accurately on the present state of Conchological science in our Dominion would require a greater knowledge of the subject than I can lay claim to, and would involve a much more exhaustive research into the writings of others than it has been possible for me to make; and, moreover, the time which I understand is allotted for this paper, viz., 15 minutes, is hardly sufficient for a very elaborate treatment of any subject.

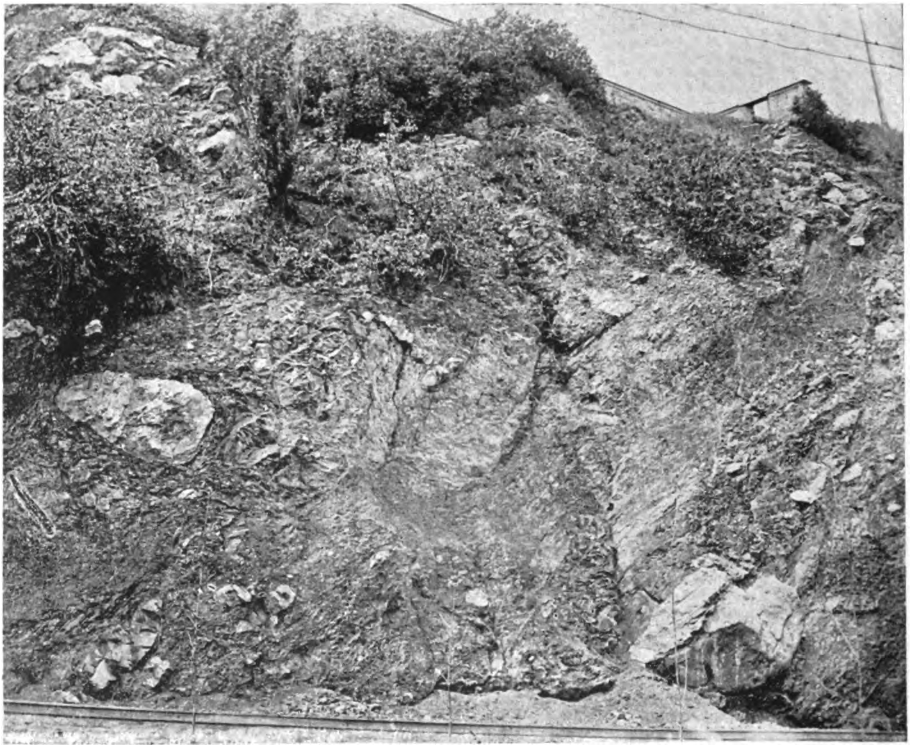
What I shall attempt this evening, therefore, will simply be to give you, as shortly as possible, a summary of what has been published up to the present time with reference to Canadian shells, and then to point out, as best I can, what still remains to be done, and the particular way in which we, as a society of Field-Naturalists, and as individual students, may help to advance this important and interesting science.

As the Dominion of Canada extends from ocean to ocean, there are at least two distinct *marine* Faunas to be studied. There are also the very numerous *land* and *freshwater* mollusca, some confined to our eastern provinces, some to the western, while others range through the length and breadth of our territories.

No naturalist, except our fellow member the accomplished Zoologist to the Geological Survey of Canada, (Mr. Whiteaves), seems to have given special study to the subject of Canadian mollusca as a whole, and so for convenience sake I will in this paper divide my remarks into 3 parts, and will take

(1.) The marine mollusca of the Atlantic Coasts.
(2.) Those of the Pacific Coast.
(3.) The land and freshwater shells of the Dominion.

Of necessity I must omit all reference to that very important part of conchology which treats of our fossil shells, and, in order to keep my paper within proper limits as to length, I will reserve bibliographical details for an appendix, in which I will try to enumerate all the most important papers that have appeared bearing upon our subject.



CLIFF ON MOUNTAIN HILL, QUEBEC CITY,

Shewing masses of fossiliferous limestone imbedded in contorted shales.

(To illustrate Mr. Weston's and Dr. Ami's paper.)

BRITISH AMERICAN BANK NOTE CO., MONTREAL

NOTES ON THE "QUEBEC GROUP."

By T. C. Weston, Esq., F.G.S.A., of the Geological Survey of Canada.

Out of the 12,000 feet or more of strata which form the much discussed "Quebec Group," there are several interesting escarpments and sections which have hitherto not received the attention they deserve. One of these escarpments is the Mountain Hill cliff, * which forms a portion of the heights over which the ramparts of the City of Quebec are built.

The only reference I can find, at the present time, to this special locality, is Dr. Ami's paper on "the Geology of Quebec and environs," published in the "Bulletin of the Geological Society of America," Vol. II., pp. 477-502, 1891, from which I quote the following. "Alongside and up the Mountain street, a bold cliff of conglomerate occurs, containing large boulders, imbedded in a shaly and calcareo-argillaceous paste, with an admixture of quartz grains. This deposit, as well as most of the exposures in Quebec city, deserves very special attention, and will no doubt afford interesting notes and material."

A close examination of the cliff immediately facing Mountain Hill House, on the lower part of the hill, shows it to be composed of a coarse grey nodular limestone; in places, bedded structure may be seen, while the principal portion, (which is the matrix of the conglomerate), is compact, and sometimes flinty, with seams of carbonaceous or bituminous matter.

This portion of the cliff is prolific in fossils, but they are chiefly fragmentary, and might readily be overlooked. This is probably the reason why in the early study of the geologic structure of the city portion of the 'Quebec Group,' these were included in the Levis division of the same.

No fossil remains had been found or observed in the Mountain Hill cliff until the summer of 1877, at which time the writer discovered a number of interesting species. In 1892, another opportunity was afforded me to examine that portion of the exposure immediately back of the Express office and adjoining the book-binding establishment. On that occasion there were found some remarkably well-preserved fossils,

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*See Plate accompanying this and next paper.

some of which were immediately recognized as being characteristic Trenton forms. Dr. Selwyn arriving in the city at that time, accompanied me to this locality, and several new species were added to our former collection.

In conjunction with this paper will be found a list of the genera and species of fossil remains determined by Dr. H. M. Ami, of the Survey. It will be readily seen from the lists prepared that a good proportion of them are common Trenton forms—a gratifying circumstance to the Director of the Geological Survey of Canada—Dr. Selwyn—who was the first to recognize the Quebec city rocks as a portion of the Trenton zone, and not *Levis*, as originally supposed.

However, as the formation under consideration contains large boulders of dolomitic limestone, which were evidently derived from the Levis limestone conglomerates, in which we may find Levis fossils in the shaly portion of the cliff, as in the shales and limestones at the back of the St. John street (Montcalm) market, we must not take the whole as typical Trenton, but as a mixture of Trenton, Utica, and Hudson River.

Quebec City, Que., May, 1894.

NOTES ON FOSSILS FROM QUEBEC CITY, CANADA.

By HENRY M. AMI, M.A., F.G.S., &c.

The environs of Quebec city have long been regarded as classic ground to the student of North America Geology.

From the numerous rock-formations around the city, some of the most interesting and important specimens were obtained by various members of the Geological Survey staff, under the '*old régime*' and under the present administration.

The faunas entombed in the rocks of the so-called 'Quebec Group' at Point Levis and elsewhere, have been described by Billings, Hall, and other palæontologists. Strange to say, however, for some reason that cannot be accounted for, the sedimentary rocks forming the Citadel Hill and massif of Quebec city, remained for a very long time a *terra incognita*. It is only during recent years, that the veil has been drawn away from these obscure and difficult portions of the region in question through the researches of Mr. T. C. Weston, F.G.S.A., of our Geological Survey. It was in 1877, that, for the first time, Mr. Weston discovered fossil remains in the strata of Quebec city, and amongst the specimens collected on that occasion there were noted the obscure remains of *Leptæna sericea*, Sowerby, and of a species of *Ampyx*, closely related to *Ampyx rostratus*, together with crinoidal fragments. These came from the limestone rocks of Mountain Hill.

The purpose of this paper is mainly to note the interesting discovery of fossils made this summer by Mr. Weston, in the rocks of Mountain Hill, of which Mr. Weston gives a description in the foregoing pages of the NATURALIST. There is added to the notes on the fossil remains collected this season, a few more on the small but likewise important collection made by Mr. Weston and Dr. Selwyn in 1892. The determinations are of course preliminary and dependent upon the mode of preservation, etc.

MOUNTAIN HILL FOSSILS.

Inasmuch as the collections of 1892 and 1894 were both made by Mr. Weston—and at the very same locality, there is no practical reason for keeping them separate at this time, and for the sake of brevity they will all be grouped together under the heading of Mountain Hill fossils, Quebec City. The collections comprise in all about 125 specimens and embrace an assemblage of forms which are for the most part new to the massif of Quebec city, whilst not a few are probably new to Canada.

PRELIMINARY NOTES ON THE FOSSILS.

PROTOZOA.

1. *Nidulites favus*, Salter, var. A rather crushed and imperfectly preserved specimen of what appears to be a variety of Salter's species, *Nidulites favus*, a Rhizopod with marked affinities for such genera as *Pasceolus*, Billings; *Sphærospongia*, Salter, and *Cyclocrinus*, Eichwald. The hexagonal character of the "plates," the presence of the 'central papilla' or styliform projection in the central portion of the plate are

features which the Quebec specimen shows distinctly. The main difference is of size. The plates in the Canadian example of *Nidulites*, are considerably smaller than those in the type of Salter's species from Europe* : there being ten plates in the space of one centimetre in the former and six plates in the same space in the latter. This species has not heretofore been recorded in Canada, and forms an interesting addition to our fauna.

Note. The occurrence of this species along with many of its associates also points to the close relation which probably exists between the rock formations of the Girvan succession in Scotland, and those of the fossilferous 'Quebec group' in Canada, a correlation which had already been made apparent to the writer on account of the similarity of the faunas.

CŒLENTERATA.

2. *Streptelasma corniculum*, Hall. A small and rather obscure turbinate coral occurs in the collection. From its characters and affinities it appears to be closely related to the ordinary Trenton form described by Hall from the New York series. The Quebec specimen is here referred to in this species with some uncertainty.

3. *Diplograptus*, cf *D. rugosus*, Lapw. Among the specimens collected on Mountain Hill only one graptolite occurs, and that appears to be a diplograptid, allied to Prof. Lapworth's *D. rugosus*. It is not well preserved, and the hydrothecæ are somewhat irregular and recall *D. amplexicaulis* of the Trenton.

BRYOZOA.

4. *Pachydictya acuta ?* Hall. A number of broken and more or less imperfectly preserved stipes of this species occur on the weathered surfaces of the limestone. *Note.* Besides the above species of Polyzoa (Bryozoa)—doubtfully referred to *P. acuta*, Hall, there are several fragments of branching Bryozoa which require to be examined microscopically in thin sections before they can be determined with any degree of accuracy. From a mere superficial examination of the zoœcial aper-

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*See Nicholson and Etheridge, Jr., "A Monograph of the Silurian fossils of the Girvan District in Ayrshire, I., p. 18, 1874."

tures and characters of the polyzoary, the following genera appear to be represented :—*Monotrypella*, *Batostoma*, *Homotrypa*, etc., forms similar to those from the Trenton rocks of Canada and elsewhere.

BRACHIOPODA.

5. *Acrotheta* sp. A small but interesting specimen of this genus occurs in the collection, but its specific relations are not yet definitely ascertained.

6. *Acrotheta* sp. indt.

7. *Discina* or *Lingula*, sp. indt.

8. *Schizotreta* cf. *S. minutula*, Winchell and Schuchert. Two valves, one a brachial and the other a pedicle-valve of this interesting genus, occur associated with numerous other species of brachiopoda. They closely resemble the above species to which they are referred with some doubt whilst they also indicate close relation to *Discina Pelopea*, Billings, a true species of *Schizotreta*.

9. *Paterula*, sp. nov. An interesting form of this genus rare in America was collected in the limestones at Mountain Hill, Quebec. In general outline and leading characters it resembles closely *P. Bohemica*, Barrande, but is probably distinct. This species is certainly distinct from another species discovered by Mr. Weston in the rocks adjoining the Montcalm market, Quebec, and figured by Hall in his Vol. VIII. of Pal. N. Y. State, on Brachiopoda. This species of *Paterula* very closely resembles a form collected by Prof. L. W. Bailey in the black limestones of the Becaguimic Valley, in New Brunswick, in 1884, but is much smaller, being only one millimetre in length.

10. *Lingula Nympha*, Billings. A rather large individual of what appears to be a species identical with the above which was originally described from Newfoundland. The septum, central scars and other characters of generic importance are clearly visible, and the general outline of the shell make it very probable that this "Quebec Group" species occurs at Quebec also. With this species compare *L. Elderi*, Winchell and Schuchert.

11. *Lingula*, sp. Resembles one of the forms from the "market rocks" of Quebec—probably "species No. 1" of my appendix to Dr.

Ells's report for 1888, published in 1889. This species also resembles one from the limestones of the Beccaguimic, N.B., collected by Dr. Bailey.

12. *Lingulepis*, sp. With exceedingly fine radiating striæ. Shell: ovate, elliptical, anterior margin rounded; greatest breadth at about three-fourths distance from beak to anterior margin. Beak rather prominently pointed.

13. *Leptæna (Plectambonites) sericea*, Sowerby, sp. Two or three typical examples of this characteristic Trenton species occur in the collection from Mountain Hill. One form resembles the Hudson River or Lorraine variety, being large and quadrangular.

14. *Leptæna* (*Plectambonites*) sp. A diminutive form of Leptæna closely resembling *L. sericea*, but probably distinct also occurs in the collection.

15. *Strophomena Aurora*, Billings.

16. *Strophomena* (*Rafinesquina*) *alternata*, (Conrad, MS.) Emmons.

17. *Strophomena* (*Rafinesquina*), sp. nov.

18. Strophomena or Leptænoid shell, similar to the form occurring at the Montcalm market exposures. Probably new generic type.

19. *Orthis* (*Dalmanella*) *testudinaria*, Dalman.

20. *Orthis* (Plectorthis) *plicatella*, Hall. Probably the above species. The specimen is not sufficiently well preserved to state definitely. May be Orthis (Dinorthis) pectinella, Conrad.

21. *Orthambonites ?* sp.

22. *Camerella* or *Anastrophia*, *sp.*

GASTEROPODA.

23. *Metoptoma*, sp. There appear to be two forms of this genus in the collection from Mountain Hill, one a comparatively large form the other much smaller. The smaller ones shows concentric zones. Beak in both eccentric pointing anteriorly.

24. *Murchisonia ?* sp.

CIRRIPEDIA.

25. *Turrilepas*, sp. nov. Several specimens of a species of Tur-

rilepas occur in both the 1892 and 1894 collections. This species is identical with another found in a lot of Newfoundland fossils, labelled "Port-aux-Choix," and collected by Mr. Richardson. The species is very closely related to one of the forms described by Nicholson and Etheridge from the Girvan district (*loc. cit. ante.*)

ENTOMOSTRACA.

26. *Primitia* sp. No. 1.
27. " sp. No. 2.
28. *Isochilina* sp. indt.

TRILOBITA.

29. *Ampyx*, cf. *A. normalis*, Bill., or its near ally. *A. rostratus*, Sars. The latter species occurs in the rocks of the Girvan succession, and this is abundant in the rocks of Mountain Hill. It was collected in 1877, in 1892 and 1894.

30. *Amphion ?* sp. indt. An imperfectly preserved or obscure pygidium of a trilobite, which is most probably referable to this genus.

31. *Bathyurus*, sp. No. 1.

32. " sp. No. 2.

33. *Dolichometopus ?* sp. or *Symphysurus*, sp.

34. *Remopleurides*, sp. No. 1. Apparently new. Differs somewhat from *D. Schlothimi*, Billings, and from *D. Canadensis* and *D. affinis*, already described from Canadian rocks. It belongs to the typical or smooth form, of which the last two mentioned are types.

The Mountain Hill specimens, which are tolerably abundant, are not unlike in general outline to *Remopleurides Barrandii*, Nicholson and Etheridge Jr., good specimens of the cephalon of this species occur in both the 1892 and 1894 collections.

35. *Remopleurides*, sp. No. 2. Smaller form.

36. *Dalmanites callicephalus ?* Green.

37. *Calymene senaria*, Conrad. (= C. tuberculata, of European authors, also *C*, *Blumenbachii*.)

38. *Asaphus canalis*, Conrad.

39. *Asaphus*, sp. cf. *A. megistos*, Locke.

40. *Ceraurus pleurexanthemus*, Green.

41. *Phacops Brongniarti*, Portlock, or a very closely related species.

42. *Microdiscus ? ?* sp. indt., or *gen. nov.* A very diminutive form of trilobite occurs with *Nidulites favus ?* Salter, and *Remopleurides* sp. No. 1. It is more closely related to the genus Microdiscus.

43. *Trinucleus concentricus*, Eaton. Very fine and numerous examples of this typical Trenton species occur in Mr. Weston's collection. These are precisely like those which occur at Montmorency Falls, above the Falls, near Quebec.

44. *Trinucleus*, sp. indt. A much smaller but prolific form of this genus occurs with many of the foregoing species. It differs from the other chiefly in size, in being strongly tuberculated and in other subordinate characters. Head and pygidium *four* millimetres and scarcely *four*, respectively.

45. *Illænus*, sp.

Note.

(*a.*) Besides the above there appear to be indications of the presence of such forms as *Agnostus*, *Staurocephalus*, *Dicranopora*, and numerous fragments of crinoidal and cystidean remains.

(*b.*) It may not be uninteresting here to note the discovery made by Mr. Weston this summer, in the rocks on Valier street, Quebec city viz. a portion of a large crinoidal column *eight* millimetres in diameter. A length of 7.5 mm. of the column is preserved.

This specimen strongly resembles similar crinoidal fragments sent to Mr. Whiteaves, of the Geological Survey, in 1882, and belonging to the "Wappinger limestone" of the vicinity of Poughkeepsie, N.Y.

(*c.*) It will thus be seen, that so far, from the interesting collections made by Mr. Weston in 1877, 1892 and 1894, respectively, we have no less than *forty-five* species of fossil remains. These will, no doubt, be supplemented by new and in such cases, probably better specimens, so that this preliminary report will probably be superseded before very long. A great deal of credit is due Mr. Weston for his perseverance in the work he has accomplished, and the present paper brought out in connection with the announcement of this discovery by

Mr. Weston, is prepared in the hope that it will help to throw some light upon a district which, although in the midst of a large and growing population, is still almost entirely unknown and unwritten.

(*d.*) The following is a recapitulation of the species included in the paper:

Rhizopoda.

1. Nidulites favus ? Salter.

Cœlenterata.

2. Streptelasma corniculum, Hall.
3. Diplograptus, cf. D. rugosus, Lapworth.

Bryozoa.

4. Pachydictya acuta ? Hall.

Brachiopoda.

5. Acrotheta, sp.
6. Acrotheta, sp. indt.
7. Discina or Lingula, sp.
8. Schizotreta cf. S. minutula, W. and S.
9. Paterula, sp. nov. cf. P. Bohemica, B.
10. Lingula Nympha, Billings.
11. Lingula, sp.
12. Lingulepis, sp.
13. Leptæna (Plectambonites) sericea, Sow.
14. Leptæna, sp.
15. Strophomena Aurora, Bill.
16. Strophomena (Rafinesquina) alternata, Emmons.
17. " " sp. nov.
18. Strophomena or Leptæna ?
19. Orthis (Dalmanella) testudinaria, Dalm.
20. " (Plectorthis) plicatella ? Hall.
21. Orthambonites ? sp.
22. Camerella or Anastrophia, sp.

Gasteropoda.

23. Metoptoma, sp.
24. Murchisonia ? sp.

Cirripedia.

25. Turrilepas, N. sp.

Entomostraca.

26. Primitia, sp. No. 1.
27. " sp. No. 2.

28. Isochilina, sp. indt.

Trilobita.

29. Ampyx, cf. A. normalis, Bill., and A. rostratus, Sars.
30. Amphion ? sp. indt.
31. Bathyurus, sp. No. 1.
32. " sp. No. 2.
33. Dolichometopus ? sp., or Symphysurus, sp.
34. Remopleurides, sp. No. 1. (n. sp.)
35. " sp. No. 2. (n. sp.)
36. Dalmanites callicephalus ? Green.
37. Calymene tuberculata, (= C. senaria), Conrad.
38. Asaphus canalis, Conrad.
39. " sp. cf. A. megistos, Locke.
40. Ceraurus pleurexanthemus, Green.
41. Phacops Brongniarti, Portlock.
42. Microdiscus ? ? sp. indt.
43. Trinucleus concentricus, Eaton.
44. Trinucleus sp. indt probably n. sp.
45. Illænus, sp.

Ottawa, August, 1894.

SUGAR AND ITS MANUFACTURE.

By Adolf Lehmann, B.S.A., late Asst. Chemist, Dominion Experimental Farms.

The manufacture of sugar is an art which, like many others, has come to us from the far East. Its beginning is somewhat obscure, but probably it was first carried on, in a primitive and very limited way, by some of the tribes or nations of India. It has since, with the successive strides of civilization, assumed greater and grander dimensions. The Persians, Arabians and Spaniards, have in their turn been improving and extending cane-sugar manufacture. Other nations, notably the English, and in former days the Italians, especially the Venetians, have materially assisted in this work.

In Persia, the industry was relatively at its height during the eleventh century. At this time the product was especially prized as a medicine; in fact it was manufactured for this purpose until the extended use of tea and coffee made its use more universal. Shortly after the discovery of America, the industry was planted in the West Indies. Soon these islands began to supply the principal portion of this commodity, a position they retained for centuries. But during the past thirty or forty years, cane sugar has found a strong competitor in beet sugar. Now, Germany stands at the head of the sugar producing nations, and the beet furnishes the principal portion of the sugar on the market. This position has not been attained through the superiority of the beet as a sugar producing plant--for it is more difficult to manufacture sugar from it than from the cane—but through the energy, perseverance, and almost endless work of men of science.

In 1747, Marggraf, a German chemist, the director of the Academy of Science at Berlin, discovered sugar in different members of the beet family. His pupil and successor, Karl Achard, built in 1799 the first beet sugar factory near Berlin. He spent a fortune and a large portion of his time in developing the industry, and he may be said to be the father of it. Shortly before Achard's death, Napoleon I. placed such restrictions on the importation of sugar into the continent of Europe that at one time it reached the price of about 75 cents a pound. In addition to this import tax he compelled farmers to plant a definite area with sugar beets, and in other ways assisted the beet sugar industry. It flourished for a time, but appeared to be almost dead, especially in Germany, after these favourable legislations were removed. However, improved methods of manufacture and a careful attention to the cultivation of the beet, together with reduced prices in other farm crops, have made it an industry which, instead of receiving a bounty, pays a handsome revenue to the state in the form of an excise duty.

It is largely to the promoters of the beet sugar industry that we are indebted for the great reduction in the price of sugar. They have placed it within the reach of all, and transformed the luxury of yesterday into the necessity of life of to-day. They have also revolutionized the cane sugar industry—an industry which, although perhaps a hundred times as old as its young rival, still looks to it for instruction.

The plant from which sugar was almost exclusively made till the introduction of the sugar beet is the sugar cane, *Saccharum officinarum*. It is a plant which in appearance is not unlike Indian corn. The stalk is from one to two inches in diameter at its base, and generally from five to eight feet in height, although occasionally, especially in the more southern countries, it reaches fully double that length. The colour varies from a greenish yellow and a yellowish green to a deep purple, depending upon the variety. Some varieties are striped, others are uniform in colour. The leaves are somewhat narrower, but otherwise resemble those of Indian corn. In Louisiana, the seed never ripens, in fact the flowers are never seen. In more southern latitudes where its growth is not interfered with by frost, it matures in about 18 months. It is a perennial. Its seeds are small and its flowers form an open panicle.

On the North American continent, Louisiana has ever held the position of the sugar manufacturing centre. The centennial of the first manufacture of sugar was celebrated at the sugar experimental station of Louisiana on June 30th, 1894. The southern half of the State is almost exclusively devoted to this industry, and but little cane is grown north of this. The sugar-cane is propagated by a modified form of cuttings. The stalks, or sometimes portions of them, are laid in a horizontal position, generally two along side of each other, in furrows from four to eight inches deep and covered with finely pulverized earth. These stalks serve the same purpose as the planted potato. The buds develop into the new plants and the stalks serve to supply nutrition to them till they are able to draw food from the soil. The rows of cane are generally about five or six feet apart, formerly they were from three to five feet. In the rows the plants appear about every six to twelve inches; but, as the season advances, these multiply by stooling, tillering, or suckering, in direct proportion to the fertility of the soil. With favourable conditions an acre will produce upwards of 30 tons of cane, and each ton gives 175 to 200 lbs. of sugar.

In Louisiana, where frost that injures the cane, frequently occurs in the latter part of December, harvesting is generally begun about the middle of October, and continued for two or three months. The cane is cut by hand with very wide thin-bladed knives about 18 inches long. The leaves and top of the cane are removed at the same time and the and the stalks conveyed by carts, or on the larger plantations, by cars to the sheds of the factory. Here it must not be allowed to accumulate too much; for, like sorghum (and other plants from which sugar is occasionally made), cane deteriorates soon after it is cut. At present, the majority of planters have their own sugar houses. These are, however, gradually being replaced by central factories, and in the course of time the manufacturing of sugar and the growing of cane may become separated, like the producing of milk and the making of cheese have become in Ontario.

As in other plants, the sugar of the cane is found dissolved in the juice. In Louisiana, this juice contains about 9%–14% of sugar, sucrose, 1% to 2 % glucose, and about an equal quantity of other solids. Two methods are at present used, on a large scale, to extract the juice. The one most generally employed for cane is that of pressing it out by passing the stalks as they come from the field between large iron rollers which almost touch each other. These rollers are frequently almost three feet in diameter, and six to seven feet long, and five, six, or even nine of them are placed in successive sets of three near each other. In the case of a five roller mill, the front set has three rollers and the one behind the remaining two. The stalks of cane in passing through these successive sets of rollers are, of course, pressed twice in each set of three; for two rollers are lying side by side at the bottom and the third is placed above and between these, in such a position that it almost touches the second one of the lower rollers but allows a little more space to be between it and the first of the lower rollers. This enables the cane to pass easily into the mill and to be at the same time thoroughly pressed. In order to make the extraction of the sugar from the cane as complete as possible, the cane is generally moistened with water while passing from one set of rollers to the next. When the stalks leave the mill they are practically dry and torn into comparatively small pieces, and present a somewhat spongy appearance. They are now largely used as fuel under the boilers of the sugar houses. The other method for extracting the sugar from the cane is called the diffusion process. It is the method almost exclusively employed in obtaining the sugar from beets. In it the cane is first cut transversely into pieces not more than an inch long, subsequently sliced, or shredded longitudinaly as fine as possible, and packed tightly into a battery of iron cylinders or cells all connected with each other by pipes. Water is pressed into the first cell and from it to each succeeding one, remaining about ten minutes in each. Fresh water is passed through in this way several times, or until the chips in the first cell are practically free from sugar. These chips are then thrown out. After the cell has been refilled with fresh chips of sugar cane it becomes the last instead of the first of the chain. All the cells are successively treated in like manner. Thus as little water as possible is used to dissolve out the sugar–a very important factor, since all the water will have to be evaporated off. This so-called diffusion juice contains approximately two thirds the percentage of sugar found in the mill juice of the same cane; or in other words, two thirds of the "diffusion juice" may be considered as pure juice and the remaining third as water added to it.

The juice, no matter how obtained, contains in addition to water and sugar, a considerable portion of other compounds. Among these are albuminoids, amides, colouring matter, organic acids, gums and mucilages. All these have to be removed as much as possible before the evaporation of the water is begun. Frequently sulphur dioxide, produced by burning sulphur, is first used as a bleaching agent; but unless it is decided to produce the highest grades of sugar directly at the sugar house, the advisability of its use may be somewhat questionable, since it has a tendency to reduce the sugar yield. Lime is invariably used as a clarifying agent, either alone or directly after the use of sulphur dioxide. It is generally added, suspended in water, to the juice, in large iron tanks—generally enough to make the juice slightly alkaline. The mass is slightly boiled and the skum removed from the top several times, or rather just as the scum forms The precipitate is allowed to settle and the clear liquid drawn off. A further clarification and the removal of any excess of lime by the use of phosphoric acid will probably be adopted in the near future. The skimmings and setlings are pressed through heavy canvas filters, and the liquid separated from them, which of course contains a considerable percentage of sugar, is added to the other portion of clarified juice, which is now ready to be boiled into sugar. The solid portion is thrown away or used as a fertilizer.

The evaporation of the juice is generally carried on in two stages. The first, to near the point of saturation; and the second to such a consistency that it will still run readily out of the vessel in which it has been boiled. Both these concentrations are almost invariably conducted in a partial vacuum. The vacuum is increased with the concentration of the juice. The initial evaporation is generally done in two or three separate vessels, the steam of the first being used to heat the second and that of the second to heat the third. The final concentration is accomplished in a large iron vessel containing seldom less than five to six tons of sugar, or rather of a mixture of molasses and sugar, when the boiling is completed.

The molasses is separated by centrifugal force from the crystals c sugar suspended in it. In making the finer grades of sugar, the molasses still clinging to the sugar crystals is washed off either with steam or by the use of water. If a weak solution of stannous chloride is used in place of the water a sugar having a rich amber colour (Demarara sugar) is obtained. By great care in the manufacture and a liberal use of water in the centrifugal it is possible to make a sugar directly from the juice. This sugar would be difficult, if not impossible, to distinguish from a product refined with animal charcoal. To get rid of the water still clinging to the crystals, the sugar is dried in a slightly inclined, horizontal, heated, rotating cylinder called a granulator. The sugar is called granulated and contains over 99% of sucrose. However, comparatively little sugar is made of this grade in the sugar houses, there being considerable loss by washing in the centrifugal. The greater portion is sold to the refiners. Here it is redissolved, filtered through animal charcoal and again boiled into sugar.

To produce a good quality of sugar, it is necessary to have the crystals of uniform size and as large as they can conveniently be made. Small crystals are liable to choke the sieve of the centrifugal, and prevent the easy and perfect separation of the molasses from the sugar, and this of course reduces the quality. The preliminary evaporation to near the point of saturation, gives the sugar maker a more perfect control of the crystallization. The process is briefly as follows: The pan in which the boiling is done is partially filled with the already concentrated juice, called syrup. This is boiled down till the crystallization has just begun. A small quantity of additional syrup is then drawn in. Thus by very slightly diluting the boiling mass the tendency to prevent any further crystals from forming is brought about. The amount of syrup added from time to time must be enough to do this but not so much as to redissolve the crystals already formed. The evaporation going on all the time, and no new crystals being allowed to form, those already there must increase in size, and that uniformly. The smaller the number of crystals relative to the size of the pan, the larger they can be made to grow.

The sugar obtained from the sugar beet, the sugar cane, the maple and the sorghum, differs only in the kind and quantity of impurities it contains. The pure sugar from all of these sources is identical. It is commonly called cane sugar, *sucrose*, the name being derived from the plant from which it was in the past principally made. In addition to sucrose, several other, however, less important kinds of sugar are on the market. The two principal of these are *dextrose* and *lævulose*, sugars resembling each other in many respects. The former is now extensively made from Indian corn by transforming the starch in it with dilute sulphuric acid and neutralizing the excess of acid with lime. It is largely used in compounding the various mixtures sold as syrup on the market—few of which are now pure concentrated cane juice. Honey is a mixture of both these sugars, dextrose generally predominating. All sweet fruits contain one or other or both of them. Cane sugar when treated with a dilute acid yields an equal quantity of both of them in invert sugar. Even continuous heating at the boiling point of water has a tendency to transform ordinary sugar into invert sugar. Both dextrose and lævulose crystallize with great difficulty. If present in a solution of sucrose they probably exercise a retarding influence on the crystallization of that sugar. Any agent, therefore, having a tendency to invert any of the sugar in the juice or syrup is doubly objectionable. Sulphur dioxide in solution has this tendency, especially when hot. Long boiling at high temperatures has also the same tendency. Both should be avoided as much as possible on this account.

In addition to the three sugars already named, at least seven others occur in nature, among these are milk sugar and malt sugar, *lactose* and *maltose*. But several times the number are known to chemists, some of them are fermentation or decomposition products, others have been made by the synthetical method. However, so far as I know, no cane sugar has ever been made by either of these ways. The stories sometimes heard that cane sugar is now made for commercial purposes from rags and sawdust are a myth. Perhaps they have arisen from the fact that dextrose is made from starch and possibly, at times, from such substances as I have just named.

Sugars belong to the carbohydrates, a class of compounds ably treated by Mr. F. T. Shutt, M.A., in a lecture on the Chemistry of

Foods, delivered before the Field Naturalists' Club during the winter of 1892. The sugars are the most soluble and the simplest members of this group. Their study from a chemical standpoint is exceedingly interesting, especially in relation to plant life, since it is highly probable that the other carbohydrates are formed from them.

REPORT OF THE CONCHOLOGICAL BRANCH, 1893.

Presented at the Annual Meeting, March 20, 1894.

To the Council of the Ottawa Field Naturalists' Club.

The leaders of this branch beg to report that while they have not during the year given as much attention to the study of the shells of this vicinity, as they, in duty, were probably bound to do, they have nevertheless something of interest to report as the result of their observations. Two new shells were added to the Ottawa list during the year, both discoveries having been made by the Rev. G. W. Taylor. *Pupa curvidens* was noticed among a number of small shells taken at Hull. In ponds near St. Louis Dam, the small English *Planorbis nautileus* var. *cristatus* was taken for the second time on this continent. It had previously been found in America only at Hamilton, where it was collected three years ago by Mr. A. W. Hanham. The occurrence of this shell at Ottawa, nearly 4,000 miles from its home, indicates how readily, in modern days, shells may become widely distributed. Its presence in the ponds at St. Louis Dam is in great probability due to the large quantity of refuse packing material, such as straw envelopes, marsh grass, etc., which have for years been thrown into these ponds. It may be that the shells themselves could not withstand the changes to which the straw and grass would be exposed from the time it was gathered in England until it was thrown into the ponds, but from the extraordinary vitality which the eggs of molluscs are well known to possess, these might continue unimpaired even under the trying circumstances that must have obtained in this case.

An important find of the exceedingly minute and rather rare *Vertigo milium* was made in Billings's bush, one wet afternoon in August on the bark of a fallen oak. Here, in ten minutes, many more specimens of this shell were found than the collector had previously seen in ten years. The large *Planorbis*, usually called ***trivolvis***, but which, in the opinion of the leaders, is quite a distinct species, was found in abundance in the Rideau River west of Billings Bridge. The shells are easily obtained in the month of May, when like all other *Planorbes*, they are very active. Observations on this shell from the egg through various stages of growth to the adult shell may be stated at some future time and a description ventured.

The trip to Meech's and Harrington Lakes, of which an account is given in number 7, vol. vii, of The OTTAWA NATURALIST, although undertaken under adverse circumstances, was attended with very happy results. An excursion to Lake Bernard, in still more inclement weather, met with little success, as but few shells could be collected. The Gatineau River, owing to its rapidity and the few bays which it contains, is noted for the absence of molluscan life. At Farrelton, however, in September, when the water was very low, a surprisingly large number of shells were obtained. Our three Margaritanas were found in abundance, and several others of the Unionidæ. The Ottawa River was too high throughout the summer to admit of successful collecting. The famous shoals at Duck Island, on one occasion, however, yielded a number of shells which amply compensated for the long row up and down the river.

A remunerative method of collecting small shells was found to be the gathering of moss during the autumn from woods and swamps. This moss is then sifted during the winter. In this way no less than 14 species were collected in one bag of moss taken from the edge of the swamp to the south of the St. Louis Dam.

The leaders will be pleased at all times to assist members either with instructions as to the best methods and localities for collecting, or in the naming of species.

F. R. LATCHFORD, }
J. FLETCHER, } *Leaders.*

EXCURSION No.

Will be held on Saturday, September 15th, to Galetta on the O. and P. S. Railway.

The Train leaves at 8 A.M. Tickets, 60 cts. and 50 cts.; Children half-price.

one that has been conscientiously and laboriously finished,—for it is a labour requiring great patience and skill,—will not rub off nor "crock" the whitest linen when moistened; and it will wear the weather for six or seven seasons without showing the least bit of dimness or raggedness. The unhairing, in which the over-hair is deftly combed out and off from the skin, is done by heating the skin to a certain point so that the roots of the fur are not loosened, while those of the coarser hirsute growth are. If this is not done with perfect uniformity, the fur will never lie smooth, no matter how skilfully dyed; it will always have a rumpled, ruffled look. In dyeing, the liquid dye is put on with a brush and the skins hung up and dried. The dry dye is then removed, and so on until eight to twelve coats have been applied to produce a good colour. The skins are then washed clean, the fur dried, while the pelt is moist.

The fur-seal is a voracious eater. Its food is fish to the practical exclusion of all other diet. Cod, herring and salmon must lay tribute to its insatiable appetite, and the great North Pacific, 5,000 miles across, between Japan and the Strait of Fuca is its fishing pond. A low estimate of the annual consumption of fish by seals visiting the Pribilov islands, gives the enormous quantity of six million tons. As Prof. Elliott says: "The fishing of man, both aboriginal and civilized, in the past, present, and prospective, has never been, is not, nor will it be, more than a drop in the bucket contrasted with the piscatorial labour of these ichthyophagi in those waters adjacent to their birth."

The most valuable of all furs is that of the sea-otter, which, however, is becoming year by year scarcer. Its haunts formerly extended along the whole coast of Alaska and further south, but the animal is now seldom met with. A prime skin is worth upwards of $300.

Of land furs may be mentioned the land-otter, the brown and black bears, the beaver, the red, the black, the silver and the Arctic fox, and the mink and martin. The red fox is the most widely distributed fur bearing animal in Alaska. In south-eastern Alaska the principal fur obtained is the black bear. For hunting, the Indians are provided with rifles, and they have generally a very exalted idea of the value of their game. It is not an uncommon thing for an Indian, after not receiving the price demanded at Juneau, to start off with his canoe for Port

SUMMARY

— OF —

Canadian Mining Regulations.

NOTICE.

THE following is a summary of the Regulations with respect to the manner of recording claims for *Mineral Lands*, other than Coal Lands, and the conditions governing the purchase of the same.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting, for mineral deposits, with a view to obtaining a mining location for the same, but no mining location shall be granted until actual discovery has been made of the vein, lode or deposit of mineral or metal within the limits of the location of claim.

A location for mining, except for *Iron*, shall not be more than 1500 feet in length, nor more than 600 feet in breadth. A location for mining *Iron*, shall not exceed 160 acres in area.

On discovering a mineral deposit any person may obtain a mining location, upon marking out his location on the ground, in accordance with the regulations in that behalf, and filing with the Agent of Dominion Lands for the district, within sixty days from discovery, an affidavit in form prescribed by Mining Regulations, and paying at the same time an office fee of five dollars, which will entitle the person so recording his claim to enter into possession of the location applied for.

At any time before the expiration of five years from the date of recording his claim, the claimant may, upon filing proof with the Local Agent that he has expended $500.00 in actual mining operations on the claim, by paying to the Local Agent therefor $5 per acre cash and a further sum of $50 to cover the cost of survey, obtain a patent for said claim as provided in the said Mining Regulations.

Copies of the Regulations may be obtained upon application to the Department of the Interior.

A. M. BURGESS,
Deputy of the Minister of the Interior.

DEPARTMENT OF THE INTERIOR,
Ottawa, Canada, December 1892.

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THE BEAVER (*Castor Canadensis*, Kuhl).

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once to identify the substance composing these porphyritic crystals with the mineral described later by Dr. Thomson as "Huronite." The source of these boulders was not known and the mineral never found "in situ" until 1881, when Dr. Robert Bell, (1) of Ottawa, in his examination of the country to the north-east of Lake Superior, noticed the occurrence "of a dark grey crystalline diorite (in one place rendered porphyritic by spots of light-greenish yellow felspar) on the neck of land separating Lake Mattawagaming from Lake Wabatongwashene." This rather brief description was altogether inadequate to connect the mineral with the Huronite which had previously been described by Thomson, and it was not until Dr. Harrington, of Montreal, visited the spot on professional business some year later, that the true identity of these "spots" was clearly established. In 1891, Dr. Selwyn, of Ottawa, happened to be at the same locality which is situated between Missinaibi and Loch Alch Stations on the main line of the Canadian Pacific Railway, and he states that the dykes containing the Huronite cut both Huronian and Laurentian strata. During the construction of the Canadian Pacific Railway in 1884, Drs. Girdwood and Ruttan made a collection of the principal rocks met with on the main line from Chalk River westward. This collection, they subsequently presented to McGill University. Among the specimens, was one of a dark green diabase with phenocrysts of a mineral resembling Huronite scattered through it. This specimen had been obtained from a dyke cutting the granitoid gneisses a few miles north-west of Pogamasing Station. The microscopical examination, however, reveals the fact that the original Drummond Island boulder was not derived from either of these localities. Mr. W. G. Miller of the School of Mines, Kingston, who acted as Dr. Bell's Assistant in 1893, mentions the occurrence of a dyke containing Huronite near the contact between the granite and slates (Huronian) at Depôt Lake in the northern part of the Township of Proctor, about fifteen miles north-east of Cook's Mills. From its geographical position and the direction of the glacial striae this would seem to be the most likely source of the Drummond Island boulder, although this cannot be ascertained with certainty as the specimen from the locality was lost. Mr. H. G. Skill, of Cobourg, Ontario, who assisted the writer in 1891, discovered another dyke containing this mineral, about one quarter of a mile north of Murphy Lake, in Timber Limits 90' Algoma District. During the progress of his explorations in the peninsula of Labrador, Mr. A. P. Low, of the Geological Survey of Canada, noticed the presence of Huronite in a dyke cutting Laurentian gneisses about ten miles north of Lake Kawachagami on the portage route between the Rupert and Eastmain rivers and also in two dykes, each about two hundred yards wide, breaking through rocks of Cambrian age, on the west branch of the Hamilton River, fifteen and twenty miles respectively, below old Fort Nascawpee, on Lake Petitsikapow.

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(1) Report, Geological Survey, Canada, 1880-2, part c, p. 4.

Dr. Harrington (private communication) has noticed loose pieces of diabase containing Huronite a few miles beyond Amyot Station. He also mentions the occurrence of a diabase dyke four inches in width, containing phenocrysts of the same mineral, a short distance east of the crossing of the Magpie River, near Otter Station, on the Canadian Pacific Railway.

Prof. N. H. Winchell, of Minneapolis, Minnesota, in his visit to the Lake Huron district, in 1889, made note of "the occurrence at Algoma of occasional very interesting boulders (1605). (1) They contain large and small rounded whitish green felspathic spots which are distributed somewhat like porphyritic crystals but they have not the regular periphery of crystals. They are in a matrix of ordinary diabase of dark green colour and the spots make the rock noticeable, their largest size being somewhat larger than an inch in diameter. Some of the boulders are put in the foundation of the great hotel which the Canadian Pacific Railroad (2) projected at Algoma, and that is where we saw them first. Dr. Selwyn recalled the dyke cutting the Animikie on the high ridge back of Silver Islet, as the only spot where such a rock is in place," Professor Winchell, who visited this place in 1879, has sent me a small chip from a specimen then collected, as well as fragments of the Algoma boulder and a small sample from a dyke near Gunflint Lake, north-west of Lake Superior. The phenocrysts of felspar in the Silver Islet specimen, according to Professor Winchell (1) are distinctly angular and not greenish, but greyish in colour. Under the microscope, these felspar phenocrysts are seen to be a plagioclase towards the basic end of the series (very probably labradorite) which has undergone only incipient alteration, whereas, in general the Huronite shows very great decomposition.

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(1) The number 1,605 refers to the number of the specimen in the rock series of the Geological Survey of Minnesota

(2) 18th Annual Report, Geological Survey, Minnesota, 1889, pp. 58 and 63.

The writer has seen numerous boulders of diabase containing this mineral in the region to the north and north-east of Lake Huron, especially on the shores of Lake Huron from Killarney westward to the mouth of the Spanish River,

During the summer of 1893, the writer also noticed a boulder of dark green diabase, on the west shore of Bear Island on Lake Temagami, with plagioclase phenocrysts, which bore a very marked resemblance to the more altered Huronite. As the felspar seemed so fresh and glassy in places, it was thought an optical examination accompanied by a chemical analysis would throw a great deal of light on the original character and composition of Huronite. Dr. Harrington kindly undertook the analysis of this felspar, which proves it to be labradorite. Under the microscope most of these crystals are quite fresh, although certain portions are more or less clouded by the presence of decomposition products, which it is often difficult to resolve, even with the higher powers of the microscope. Certain of the crystals, however, show the same alteration, only in a lesser degree, as that which characterizes the Huronite.

It will thus be seen that the mineral is by no means so rare as some have supposed, but has, on the contrary, a wide geographical distribution. The sole reason of its not being discovered, "in situ," earlier seems to have been due to the necessarily hurried and imperfect explorations first undertaken through these wild and unsettled districts.

In 1885, Dr. B. J. Harrington, of McGill University, Montreal, decided to undertake an examination of the Pogamasing mineral for purposes of comparison with that contained in the original Drummond

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(1) No. 601, 10th Annual Report, Geological Survey, Minnesota, p. 56.

Island boulder, a sample of which was contained in the Holmes collection in the Peter Redpath Museum. In the course of this investigation he discovered some very grave errors in Thomson's description. "The hardness for example is about 5½ instead of 3¼ as stated by Thomson. Instead of being infusible it is distinctly fusible (F about 5) while it contains alkalies the presence of which is entirely ignored by Thomson."(1)

Dana, in an old edition (2) of his mineralogy mentions Huronite under Prehnite, evidently deeming it an allied mineral. In 1889, (3) the same author mentions Huronite along with Weissite and Iberite as a supposed altered form of Iolite (Cordierite). In the same edition (4) he also says "Thomson's Huronite is an impure anorthite-like felspar related to bytownite, according to T. S. Hunt (priv. contrib.), excluding the 4·16 per cent of water the SiO_2 would be 47 per cent. of the remainder." Again, in the same edition, Dana states (5) "Huronite, Thomson (Min., I., 384, 1836) considered an altered mineral near fahlunite by T. S. Hunt, occurs in spherical masses in hornblendic boulders in the vicinity of Lake Huron." In the last edition of Dana's Mineralogy (6) the author, Mr. E. S. Dana, places the mineral under anorthite on the authority of Dr. Harrington's paper in the Transactions of the Royal Society of Canada, but Dana is wrong in referring the analysis made by Mr. N. N. Evans, to the Huronite of the Drummond Island boulder, for in reality it belongs to the Huronite found by Dr. Girdwood near Pogamasing. Michel-Lévy and Lacroix (7) include Huronite among the decomposition products of Iolite or Cordierite. The failure to assign to Huronite its rightful mineralogical position arose from the fact that it was impossible to ascertain its true nature by chemical analysis. It remained for the microscope to disclose its composite nature and to show its relation to the more widely known "Saussurite."

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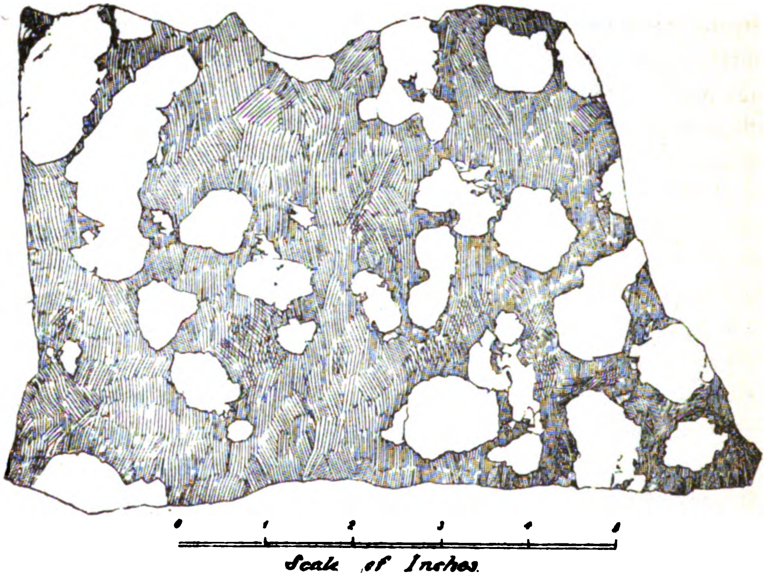
(1) See Trans-Royal Soc. Canada, Section III, 1886, p. 82.
(2) System of Mineralogy, 3rd edition, 1850, p. 313.
(3) See System of Mineralogy, 1889, p. 301.
(4) See Idem. page 34.)
(5) See Idem. page 485.
(6) System of Mineralogy, 1892, p. 340.
(7) Les Minéraux des Roches, 1888, p. 174.



Crystals of Huronite in Diabase.
(Cat. No. 905, Geological Survey of Canada Museum)
From ¼ mile N. of Murphy Lake, Algoma, Ont.

The name " Huronite " has usually been restricted to yellowish green more or less rounded masses or phenocrysts, which rarely exceed two inches in diameter, embedded in a medium textured dark greenish or greyish groundmass. Many of the smaller and not a few of the larger individuals have an irregular or jagged outline owing to magmatic corrosion and frequently exhibit small arms or bays which have been filled by the invading magma. Occasionally some are seen with a more or less perfect crystallographic outline and many exhibit one or more sharp crystal faces. The mineral is light yellowish-green in colour although portions of the crystals which have undergone less alteration show a very pale flesh red or pink colour as in the case of the Murphy Lake and Eastmain specimens. The crystals weather to an opaque greyish-white forming very conspicuous spots in an otherwise dark coloured rock. Under the microscope the greenish colour is seen to be due to the more or less abundant development of zoisite, epidote, sericite and chlorite at the expense of the original felspar. Some of the phenocrysts show a more or less perfect cleavage which is noticeably the case in the Eastmain specimen, although in the more hightly altered samples, as those from the vicinity of Missinaibi, little or none can be seen. Occasionally, crystals show macroscopically the lamellation due to polysynthetic twinning, as in some of those in the Murphy Lake diabase, but as a general rule these lamellæ are either absent altogether or so faint that they cannot be detected. The mineral is subtranslucent, varies in lustre from pearly to waxy according to degree of alteration. The hardness varies from 5½ to 6, fusibility about 5, and the specific gravity, according to Mr. R. A. A. Johnston, of the Geological Survey of Canada, varies from 2·725 in the Eastmain specimen to 2·935 in those from Missinaibi. The specific gravity, as would be expected, shows an increase in proportion to the the alteration. The microscopic examination in general reveals the fact that in every case the so-called "Huronite" is really a plagioclase near the basic end of the series which has undergone more or less complete "saussuritization." In most instances the development of zoisite, epidote, sericite, chlorite, etc., at the expense of the original felspar has been so abundant as to leave only traces of the original twinning lammellæ and occasionally to destroy all evidence of this structure. Specimens may be obtained from the large number of slides examined, showing a complete gradation of this decomposition from the pure glassy plagioclase (labradorite) composing many of the phenocrysts contained in the diabase from Temagami Lake to the completed Saussurite or Huronite in the porphyritic individuals of the Missinaibi rock. The matrix in which those phenocrysts are embedded is in general a typical diabase of dark greenish or greyish colour which likewise shows a wide difference in degree of alteration under the microscope. The specimens from Bear Island, Lake Temagami, show a very typical and fresh olivine-diabase. With the exception of some of the crystals of olivine, the rock is remarkably free from decomposition, while in the finer grained portion of the rock from Missinaibi all the component minerals have undergone great alteration. The plagioclase is more or less completely "saussuritized," the augite originally present wholly converted to hornblende (uralite) and the ilmenite replaced by the dull gray almost opaque variety of sphene known as leucoxene. A strange fact noticed, moreover, is that frequently the less altered phenocrysts of Huronite occur in an exceedingly decomposed diabase as is the case in the Pogamasing and Eastmain specimens, while the more highly altered porphyritic individuals of this mineral are frequently developed in a groundmass more or less remarkable for its freshness. This is noticeably the case in the original specimen from the Drummond Island boulder.

The first stage in the decomposition or "saussuritization" of the plagioclase shows a cloudiness due to the development of a dull, fine grained, more or less opaque material, with a higher index of refraction causing the granules to stand out in relief from the surrounding felspar. In many cases, even in the thinnest sections, this is beyond the highest power of the microscope to resolve into its component mineral or minerals. This is accompanied, or immediately followed, by the development of sericite (hydrated muscovite) in small scales showing characteristic brilliant interference colours. The cleavage planes and fissures are seen to contain large scales and plates of this mineral, while certain other cracks and fissures are filled with chlorite and serpentine resulting from the decomposition of the bisilicates present. The smaller granules now coalesce and form larger masses and individuals of zoisite and epidote, while larger plates and scales of sericite are developed and the original plagioclase is finally replaced by a comparatively coarse grained aggregate consisting of zoisite, epidote, sericite, chlorite, calcite, and felspar. Where the alteration has been extreme, as in the case of the plagioclase originally present in the matrix of the Pogamasing specimen, the lime is more or less completely removed, and the alkaline portion of the plagioclase has crystallized into pure limpid grains of albite which seldom show twinning striations and are accordingly frequently mistaken for quartz with which they are often associated.

The larger phenocrysts very frequently showed a marked difference both in the degree and character of the alteration of their central and peripheral portions. The zoisite and epidote were much more abundant in the zone or belt immediately surrounding the crystals, while muscovite is the prevailing decomposition product present in the central portion. In the plagioclase of the matrix the decomposition products are frequently grouped together in the central portion, leaving a comparatively clear and fresh periphery. Certain of the crystals of felspar are quite fresh and glassy, having for some reason escaped the alteration to which most have been subjected.

With the single exception, perhaps, of the plagioclase originally contained in the fine-grained portion of the rock from Pogamasing the decomposition has not been of such extreme character that secondary albite has resulted and in every other instance the clear felspar substance is certainly an unaltered survival of the original individual. The plagioclase of the groundmass is usually in more or less elongated forms, but occasionally mutual interference has produced at times rounded contours. In composition—to judge from the measurements of the angle contained between the maximum extinction of adjacent lamellae —the plagioclase appears to be always near the basic end of the felspar series. Some of the angles obtained are high enough for anorthite, the most basic of the felspars, but generally the angles obtained indicated labradorite as the most frequent source of the Huronite.

PETROGRAPHICAL DESCRIPTIONS.

1. *Locality.*—At Hudson's Bay Co.'s Post, Bear Island, Lake Temagami, District of Nipissing, Ontario. (From a boulder.)

In the hand specimen the rock is a dark green, medium textured diabase in which numerous large phenocrysts of plagioclase are developed. Most of these porphyritic crystals are more or less rounded owing to magmatic corrosion, although occasional individuals exhibit tolerably sharp and perfect crystallographic boundaries. Some of the crystals measure as much as three inches in diameter, but as a rule they vary from one to two inches across. They have in general a greenish tinge, although portions of some of the crystals show a flesh red colour. Most of this plagioclase is remarkably fresh and glassy, but the cleavage planes are very frequently coated with such alteration products as serpentine and chlorite derived from the decomposing bisilicates present in the matrix. The phenocrysts are often seen containing or invaded by portions of the finer-grained groundmass. This matrix weathers brownish or yellowish owing to the oxidation of the iron present, while the phenocrysts of plagioclase become a dull greyish white, thus rendering the rock very conspicuous. In general the rock bears a very close megascopical resemblance to the diabase originally described as containing the Huronite while the phenocrysts themselves differ only in the degree of alteration they have undergone. The writer regards this diabase as the least altered representative of the series of rocks studied but which, under similar conditions, would have furnished a rock differing but slightly, if at all, from any of the more decomposed specimens first noticed and described as containing "Huronite."

An analysis of a portion of one of the least altered of these phenocrysts of plagioclase, kindly undertaken by Dr. Harrington of McGill University, proves the species to be labradorite. The followiug are the results :

Silica	54·19
Alumina	28·42
Ferric Oxide	0·77
Ferrous Oxide	0·41
Manganous Oxide	Trace
Lime	10·47
Magnesia	0·52
Soda	4·47
Potash	0·63
Loss on ignition	·59
	100·47

The specific gravity of carefully selected fragments with the bottle was 2 679.

Under the microscope the rock is seen to be a very typical and rather fresh olivine-diabase. In many instances the large phenocrysts are quite fresh and give the extinction angles characteristic of labradorite. Very often, however, irregular areas and patches have undergone considerable "sericitization," the resulting scales of hydrated muscovite being very minute. Occasionally this alteration is carried farther and both zoisite and epidote are present in addition to the sericite as a result of secondary action. At times a narrow border surrounding those crystals exhibits a micro-perthitic structure. A careful examination adduced sufficient evidence to indicate clearly that a more extended altertion of these phenocrysts of labradorite would produce the so called Huronite. The fine-grained portion of the rock in which these crystals have been developed is a fresh aggregate composed chiefly of plagioclase (labradorite), augite and olivine. The ophitic or diabasic structure is very pronounced. The plagioclase is usually idiomorphic forming an interlacing network of lath-shaped crystals, the interstices of which are filled with augite and olivine. The augite possesses the reddish colour and pleochroism so common in diabase, the larger grains showing frequent distortion and occasional dislocation. Both the felspar and augite exhibit undulatory extinction as an effect of pressure. The olivine, as usual, occurs in irregular, more or less rounded individuals, only very rarely presenting sharp crystallographic outline. Commonly, it is rather fresh, showing a colourless or light greenish section with characteristic high relief, rough surface and brilliant interference colours. It is rarely so fresh, however, as to be without traversing fissures filled with more or less opaque alteration products. In many instances the original olivine grain is represented by a greenish or yellowish material, probably serpentine. Small scales or grains of opaque iron ore (magnetite) are associated with this serpentine indicating that they were also a result of the decomposition of the olivine. Less frequently, perhaps, the olivine shows a very interesting and rather unusual alteration to talc, but the resulting scales of this mineral were so small that this could not be ascertained beyond dispute. The talc is of a very pale green colour, slightly pleochroic, and exhibits very brilliant interference colours between crossed nicols. It occurs as a matted or felted aggregate of very minute scales filling the original olivine grain. The talc is usually accompanied by more or less opaque iron ore and occasionally some chlorite. (1) A considerable quantity of biotite is present which in some cases has undergone considerable "bleaching" owing to the removal of iron, while in other cases it is altered to chlorite. Apatite is also a tolerably abundant accessory constituent. The magnetite occurs usually in irregular black grains, most of which have resulted from the decomposition of the olivine. Frequently, however, it occurs in tabular or rod-like forms, which are sometimes arranged in one set of parallel planes only, while in other cases they lie in two sets of planes intersecting one another. These rod-like forms penetrate all the constituents of the rock. In many instances the smaller rod-like forms occur in association with the biotite, and their correspondence in position with the planes of cleavage of this mineral suggests that in these cases, at least, their formation has been due to secondary action ("Schillerization"), involving the elimination of the iron and the development of magnetite along the planes of easy cleavage.

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(1) Vol. III. Geol., Wisconsin, p. 235.

2. *Locality.*—S.E. ¼, N.W. ¼, Section 19, 65, 3, cutting on the Port Arthur, Duluth and Western R.R., just west of the narrows of Gunflint Lake, Minnesota. (1)

Mr. U. S. Grant, who kindly sent me the specimen at Prof. Winchell's request, says: "The rock is from one of the diabase sills (2) in the lower or iron-bearing member of the Animikie. The markedly porphyritic character is only local, the main part of the sill being without phenocrysts. These porphyritic patches are sometimes rather sharply marked off from the main mass of the sill, but they usually pass into the non-porphyritic parts simply by a gradual loss of the large crystals. This sporadic development of large felspar phenocrysts in certain of these Animikie sills is a rather common feature."

Macroscopically the rock resembles very closely the boulder brought from Lake Temagami, being a dark green diabase with phenocrysts of fresh plagioclase which exhibit the polysynthetic twin lamellation very beautifully.

The microscope reveals a rock composed mainly of plagioclase and augite with pronounced ophitic structure. The augite when fresh is of the reddish and slightly pleochroic variety so common in diabase, but it shows abundant alteration to greenish or brownish green hornblende (uralite). The opaque iron ore has the same rod-like development noticed in the examination of the preceding rock. Biotite is present and shows considerable "bleaching" and chloritization. The larger phenocrysts, which are probably labradorite, are mostly quite fresh and glassy, but irregular areas are more or less clouded by the development of minute scales of sericite or kaolin. The rock differs from the Temagami specimen in the absence of olivine and the advanced uralitization of the augite

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(1) Specimen No. 951, Geographical and Natural History Survey of Minnesota, collector U. S. Grant, see 22nd Annual Report, p. 82.

(2) Logan hills of Lawson, see Bulletin 8, Minnesota Survey.

3. *Locality.*—Landing at Silver Islet, north shore of Lake Superior.

Prof. Winchell thus describes this rock (601): (1) "A coarse porphyritic 'dioryte' in a dyke running parallel to and contiguous, to and passing into (602) a fine grained 'dioryte' in the form of a dyke. The interval of transition is perhaps two feet wide, and the crystals of felspar are scatteringly disseminated through it on the south side, and wholly disappear on the north side. They run in the same direction as the dyke on Silver Islet. The whole is 45 feet wide, but is evenly divided between Nos. 601 and 602 from about a mile north of the 'Landing at Silver Islet.'"

The thin section under the microscope showed an aggregate of plagioclase (labradorite), augite, serpentine and opaque iron ore. The phenocrysts of plagioclase as well as the lath-shaped crystals present in the groundmass show more or less 'cloudiness' due to the development of minute scales of muscovite. Irregular fissures traversing the felspar are filled with yellowish green serpentine derived from that present in the surrounding matrix. The augite, which is quite fresh, has a reddish colour, and is slightly pleochroic. It occurs in irregular grains and areas filling in the spaces between the plagioclase laths. The yellowish green serpentine, which is abundant, is present in areas whose external form and internal arrangement at once suggest its alteration from olivine, which was no doubt originallv present. These phenocrysts of labradorite are much fresher than those to which the name "Huronite" has usually been applied, but under similar conditions of alteration there is no doubt that they would become so decomposed as to be indistinguishable from this mineral.

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(1) Specimens Nos, 601 and 602, 10th Annual Report of Geological and Natura History Survey, Minnesota, page 56.

4. *Locality.*—Knob or Fault Hill, west branch Hamilton River, 20 miles below old Fort Nascawpee on Lake Petitsikpow, (1) Labrador Peninsula.

The specimen, according to Mr. A. P. Low, is from a dyke cutting the ferruginous limestones and shales of Knob or Fault Hill, a prominent topographical feature, as it rises rather abruptly to the height of 350 feet above the surrounding country. The dyke occupies the summit of the hill, while 200 feet below come in the stratified rocks through which it has been intruded. Neither the width of the dyke nor the nature of its contact with the bedded rocks could be ascertained owing to the accumulation of drift material, but it certainly cannot be much less than 200 yards.

Macroscopically the hand specimen shows a medium textured dark green almost black diabase containing occasional small and imperfect phenocrysts of a light greenish grey plagioclase which has undergone incipient "saussuritization." Under the microscope the rock is seen to be composed of an aggregate of plagioclase, augite, serpentine, and ilmenite. The augite is very fresh, has a light brownish red colour and shows a marked pleochroism. In general its form is allotriomorphic, filling in the spaces between the felspar, but occasional individuals exhibit sharp and perfect crystal boundaries. The plagioclase occurs in more or less elongated lath-shaped crystals which are often somewhat stout and rounded thus producing a rather coarse ophitic structure. Many of the small individuals are quite fresh, but the larger ones show considerable alteration to sericite and epidote. The resulting "saussurite" is in no instance so abundantly developed as to destroy the polysynthetic twinning striæ. The large amount of serpentine noticed in this rock has evidently resulted from the decomposition of olivine originally present. The serpentinization of the olivine is in every instance completed, and only the outline and structure of the serpentine individuals serve to indicate the mineral from which it has been derived. These occasionally show a network of fibrous serpentine which was first produced, the greenish fibres standing perpendicular to the cracks along which they have been developed. Owing to this parallel arrangement of the fibres, the serpentinous substance gives a faint but definite reaction with polarized light. The meshes of the net-like structure thus produced are filled with more finely developed scales and fibres of serpentine which are nearly, if not, quite isotropic. These decomposed grains are often seen embedded in the fresh augite. The ilmenite occurs in large irregular fragments or in small more or less rounded granules and in both cases shows characteristic alteration to leucoxene. The leucoxene is of the usual opaque grey colour, but sometimes brownish grey, and frequently show, especially in the thinner portions of the slide as also the smaller fragments, the brilliant chromatic polarization of sphene of which it is simply a variety.

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(1) Reference No. 4, A, p. 28, Book II., Low, 21/6/94.

5. *Locality*.—¼ mile north of Murphy Lake, Timber Limit, 90, District of Algoma, Ont.

The specimen is from a dyke cutting rocks of Huronian age. The matrix is a normal dark green diabase whose ophitic structure is megascopically apparent. A freshly exposed surface shows the Huronite to be of the usual pale yellowish green colour, while the less altered portions of the crystals have a more or less pinkish or flesh red colour. In many of these individuals a somewhat indistinct cleavage and a rather faint striation due to multiple twinning may be seen. The matrix weathers a brownish colour while the phenocrysts become a dull opaque greyish white thus rendering portions of this rock which have been subjected to atmospheric action very conspicuous.

Microscopically, the Huronite is seen to be labradorite which has undergone more or less "saussuritization." A narrow border usually surrounds these phenocrysts of labradorite which is free from the products of decomposition, but immediately within this rim is a zone or band where the alteration has been extreme and here the resulting zoisite, epidote and sericite replace nearly, if not quite, all of the original felspar. The epidote and zoisite are present in irregular grains or masses, while the sericite, as usual, occurs in scales and plates. All of these alteration products have a more or less definite arrangement. The grains and imperfect crystals of epidote and zoisite are usually elongated in a direction corresponding more or less with the twinning striations or in a direction nearly at right angles while the scales and plates ot sericite have a similar development.

The specific gravity, ascertained by Mr. R. A. A, Johnston, of these porphyritic crystals was 2·758.

The matrix of these crystals is a rather fresh diabase with pronounced ophitic structure and composed chiefly of plagioclase and augite. The plagioclase is idiomorphic and forms an interlacing network of lath-shaped crystals. Occasional crystals are rather fresh and glassy, but usually they exhibit the same alteration as the larger porphyritic individuals, and apparently belong to the same species of felspar (labradorite). The decomposition products aggregate themselves toward the centre of the crystal leaving a somewhat fresh periphery. The augite is in general quite fresh, but occasionally an individual was seen partially altered into green, strongly trichroic hornblende. Twins are common. A considerable quantity of biotite is present which is always more or less altered to chlorite. Ilmenite, an abundant constituent, occurs in irregular grains and only shows incipient alteration to leucoxene. Occasional prisms of apatite were noticed, chiefly developed in the chloritized biotite. The more unaltered portions of the plagioclase show the undulatory extinction due to pressure. Pyrite is also an abundant constituent.

6. *Locality.*—Algoma Mills, north shore of Lake Huron, district of Algoma, Ontario. (1)

The thin section exhibits a rock very similar to the one just described and must be regarded as being derived from a dyke almost analagous in character and composition to that exposed near Murphy Lake.

The phenocrysts of labradorite show the usual alteration into an aggregate composed chiefly of muscovite, epidote and zoisite although considerable portions of some of the crystals are free from these decomposition products. The augite has a light yellowish colour and is only slightly pleochroic. Twins are common, the twinning plane and composition face being the orthopinacoid.

Curved or distorted individuals were often noticed exhibiting the

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*From a boulder No. 1605, Geological Survey of Minnesota, series of rocks, 18th Annual report, page 58.

"strain shadows" due to pressure. A good proportion showed an incipient uralitization. The plagioclase of the groundmass has also undergone more or less "saussuritization" and occurs in stout and rounded laths thus producing a rather coarse ophitic structure. The ilmenite present in irregular grains is often fresh but shows occasional incipient alteration to leucoxene. A small amount of chlorite is also present.

7. *Locality*—Shore of Drummond Island, Lake Huron, (from a boulder.)

The slide was made from a fragment, obtained through the kindness of Dr. Harrington, from a duplicate specimen of the original boulder at present in the Holmes collection of the Peter Redpath Museum of McGill University. The first examination and analysis by Dr. Thomson was rather imperfect as pointed out by Dr. Harrington (1) but it has been thought advisable to reproduce the analysis, though imperfect, for purposes of rough comparison. This analysis is as follows:

Silica	45·80
Alumina	33·92
Ferrous Oxide	4·32
Lime	8·04
Magnesia	1·72
Loss on ignition	4.16
	97·96

The specific gravity, according to Dr. Thomson, is 2·8625. Under the microscope the phenocrysts of the so-called "Huronite" are seen to be a decomposed aggregate of zoisite, muscovite, epidote, calcite, chlorite and felspar. Occasionally there is a very narrow border of comparatively unaltered felspar surrounding these individuals, in which traces of the very fine striation, due to multiple twinning, may be observed. Immediately within this band, however, the decomposition products are most abundant, and the original plagioclase is replaced almost altogether by epidote, zoisite and muscovite, their relative abundance being in the order mentioned, while the interior of the crystals is composed mainly of muscovite with a much less proportion of zoisite, epidote and felspar.

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(1) Trans. Royal Society of Canada, Section III., 1886, p. 82.

The epidote and zoisite occur in irregular, often somewhat elongated masses or "grape-like" bunches which frequently show a more or less definite arrangemenr in accordance with the structure of the original felspar. Both minerals exhibit their characteristic high relief, the epidote showing brilliant chromatic polarization colours, and yellow to colourless pleochroism, while the interference colours of the zoisite, as usual, are very low, dull bluish to yellowish. The sericite is of a very pale green, and occurs in scales or aggregates of scales and plates, showing customary brilliant polarization colours and parallel extinction. The sericite has, likewise, often a definite arrangement, but sometimes occurs in irregular or matted aggregates. The "saussuritization" of the original plagioclase has been usually so complete, that only traces of the twinning lamellæ can be detected. The matrix in which these crystals are embedded is a diabase, composed essentially of plagioclase and augite. The plagioclase shows more or less alteration, identical in character with that of the larger phenocrysts so that it must have had a similar composition. It occurs as lath-shaped, twin crystals, often consisting of only two lamellæ, which pierce, and are often embedded in the augite. The augite occurs in more or less irregular masses, filling in the interstices between the felspar laths. It is light-brownish in colour, exhibits a faint pleochroism, and the characteristic interrupted cleavages in cross-section. It is partially altered into green trichroic hornblende, and occasionally the alteration has been carried so far that chlorite has resulted. This uralitization has only proceeded to a limited extent, and is confined to a narrow margin surrounding the irregular fissures traversing the augite masses. Occasional twins were noticed, the twinning plane being the orthopinacoid.

Ilmenite is abundant, but almost wholly converted into leucoxene. The fragments have generally jagged and irregular contours, but occasionally, some are seen which possess a rather perfect crystallographic outline. The characteristic alteration along lines parallel to the faces of the rhombohedron produces alternating bands of greyish white leucoxene, and black, unaltered ilmenite. The less altered portions of the plagioclase and the augite show uneven or wavy extinction, the "strain shadows" induced in the latter being especially well marked, and is a noticeable and interesting feature in connection with the rock. Additional evidence of pressure is furnished by the frequent distortion and even dislocation of both the plagioclase and augite individuals.

8. *Locality.*—About 4 miles N.W. Pogamasing Station, main line, Canadian Pacific Railway, District of Algoma, Ont.

The specimen was obtained from a dyke, cutting the granitoid gneisses of the Laurentian. The phenocrysts of "Huronite" have generally a rude, rounded outline, the largest of which are about two inches in diameter. Many of the smaller ones have irregular or jagged outline, and occasional individuals exhibit some of the sharp faces of the original crystal. The mineral is of the usual light, yellowish-green colour, shows the glistening surfaces of the indistinct cleavage and occasional faint-striæ. It is sub-translucent, has a waxy lustre, and a somewhat "soapy" feel. According to Dr. Harrington* "the hardness is 5½ or a little over, fusibility about 5, and specific gravity 2·814." An analysis of some of the material composing these phenocrysts was made by Mr. N. N. Evans, of McGill University, for Dr. Harrington, with the following results :

Silica	47·07
Alumina	32·49
Ferric Oxide	0·97
Lime	13·30
Magnesia	0·22
Potash	2·88
Soda	2·03
Loss on ignition	2·72
	101·68

The matrix in which these crystals are developed is a fine-grained dark green diabase, with abundantly disseminated particles of iron pyrites.

Under the microscope the "Huronite" is seen to consist of an aggregate of epidote, zoisite, sericite and chlorite, but in the larger crystals especially, considerable areas of unaltered plagioclase exist which are quite fresh and glassy, and exhibit the twinning lamellae quite distinctly. The smaller phenocrysts, however, are altogether decomposed so that there is little or no evidence of the lamellation of the original felspar. The matrix in which these crystals are embedded is an exceedingly decomposed groundmass made up of felspar, epidote, chlorite, hornblende and zoisite, with larger individuals of augite in a more or less advanced stage of uralitization. The alteration to hornblende is mainly marginal and has proceeded very unevenly, the core of unaltered augite, having thus a very irregular outline. The augite has a brownish colour and exhibits the characteristic interrupted cleavages in cross-section. The larger individuals are all twinned, the twinning plane being the orthopinacoid. The rock is so decomposed that the original ophitic structure is nearly, if not quite, obliterated. Very little trace, if any, remains of the original plagioclase of the ground mass, and instead small areas or fragments of a water-clear unstriated felspar (albite?) are present which are evidently secondary, as they contain minute embedded needless of the secondary epidote. This water clear secondary felspar has evidently been developed at the expense of the original plagioclase. (1)

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*Trans. Royal Soc. Canada, Sec. III, 1886, p. 82.

A considerable amount of ilmenite was originally present, but is now almost altogether decomposed to leucoxene. This greyish white translucent mineral occurs in masses which are generally irregular or have a rude rhombic outline, and frequently exhibits the very characteristic alteration along lines or zones parallel to the faces of the rhombohedron. The thinnest section shows the mineral to be made up of an aggregate of minute rounded grains with a high index of refraction and showing brilliant interference colours. (2)

9. *Locality.*—10 miles north of Lake Kawachagami, on the portage route between the Rupert and Eastmain rivers, in the peninsula of Labrador, Geo. Survey of Canada, Eastmain River. (3)

Macroscopically a dark greenish grey gabbro with yellowish green phenocrysts of plagioclase. The phenocrysts have a tolerably sharp, through irregular outline, the larger ones being over an inch in diameter.

Under the microscope the rock is seen to be composed mainly of plagioclase, augite and ilmenite. In places a coarse ophitic structure can be seen and the specimen doubtless represents the "granitoid" structure so characteristic of the centre portion of most diabase dykes which nearer their margin exhibit the typical ophitic structure. The larger phenocrysts show a marked alteration. Most of the sections of these crystals are made up of innumerable minute scales and fibres of light greenish sericite arranged parallel to the polysynthetic twinning lines, and therefore even where the alteration has proceeded farthest the direction of the very fine striation may still be ascertained. Zoisite and epidote have also been developed the former usually in more or less elongated prisms or lath-shaped crystals, occurring either isolated or in irregularly disposed groups. The epidote is present in irregular grains or associated with calcite filling certain fissures in the crystals. Some portions of the crystals which had escaped alteration had a distinctly reddish colour and revealed the fine twinning striæ. The crystals are precisely similar to those decribed by Thompson as "Huronite." The specific gravity of these crystals, according to Mr. R. A. A. Johnston, is 2·725 The augite has undergone more or less complete uralitization, although in most cases cores of unaltered material remain. During this process a certain amount of epidote present in the slide has been formed. The plagioclase of the matrix shows the same alteration or "saussuritization' as the larger phenocrysts, the decomposition products aggregating themselves towards the centre leaving a comparatively fresh periphery. Ilmenite is a rather abundant constituent and occasionally shows incipient alteration to leucoxene. Apatite is very abundant. The interlamination of quartz and felspar, known as granophyre, is present in considerable quantity.

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(1) Teall, British Petrography, p. 230.

(2) Notes on the microscopic structure of some rocks of the Quebec Group—Frank D. Adams—Geo. Survey, Canada, Report Progress, 1880-82, p. 16, A.

(3) Reference No. 1, p. 12, Book II, 12/7/92, Low.

10. *Locality* near Missinaibi Station, on the main line of the Canadian Pacific Railway, District of Algoma, Ont.

The specimen examined was obtained by Dr. Selwyn from one of several dykes which cut both the Huronian and Laurentian rock exposed in this region. It is a medium grained dark greyish green diabase whose ophitic structure is megascopically apparent. The porphyritic crystals vary from a pale greyish green to a light yellow green, weathering to a light grey on exposed surfaces. Very frequently they have tolerably good crystallographic boundaries, although in most cases especially in the smaller individuals they have a rather irregular outline. The specific gravity of these crystals ascertained by Mr. R. A. A. Johnston was 2·935.

Under the microscope these phenocrysts show a very advanced stage of alteration and the original plagioclase is now replaced by an aggregate of muscovite, zoisite, epidote, felspar and calcite. There is little or no trace left of the original twinning lamellae. The plagioclase laths present in the enclosing matrix show a similar alteration, although not to so large an extent. The augite originally present is now replaced by hornblende (uralite) and often the alteration has proceeded so far that chlorite has resulted. These resulting products of decomposition fill the original allotriomorphic individuals of augite. These individuals as now present usually exhibit a deep green border of strongly trichroic hornblende, while the interior is occupied by an aggregate of interlacing fibres of light green hornblende with more or less chlorite. Traces of the characteristic interrupted cleavages of augite are present in occasional grains, but no unaltered cores now remain. The resemblence to other uralitic hornblende is, however, unmistakable. (1) The hornblende also bears a close resemblence to that present in the rock just described (No. 9) in which cores of the original augite are still present. The ilmenite present is more or less altered to leucoxene showing brilliant polarization colours (compare No. 8 ante). A considerable amount of biotite of a light brown colour on account of the "bleaching" it has undergone shows rather brilliant interference colours. The biotite has also been altered in many cases to chlorite. Granophyre structure was also noticed.

11. Locality.—Lake Petitsikapow, about 15 miles below old Fort Nascawpee. West branch Hamilton River. Labrador Peninsula. (2)

The dyke from which the sample was taken, according to Mr. Low, is 200 yards in width, coarsely crystalline in the centre where the porphyritic individuals of Huronite are often three-fourths of an inch in diameter. The dyke breaks through and alters sandstones, limestones and shales of Cambrian age, running almost parallel to their strike. The specimen was taken from near the middle of this dyke, and shows macroscopically a dark greenish grey, rather coarse grained diabase, in which are embedded numerous phenocrysts of altered greenish felspar (Huronite). The crystals of "Huronite," though much smaller than usual, are on the other hand much more abundant, so that it is often difficult to obtain even a small chip of the finer groundmass, in which they are embedded. The felspar of both the larger porphyritic individuals and those present in the groundmass show great alteration, although the polysynthetic twinning lamellæ may still be recognized. The decomposition products are mainly sericite and epidote. The specific gravity of these phenocrysts according to Mr. Johnston, is 2.773. The augite when fresh (which is rarely the case except in very minute fragments), is of a reddish colour, and shows distinct pleochroison. A great deal of chlorite is present. The ilmenite occurs in irregular grains as well as fragments, which have a more or less perfect crystallographic outline and occasional perfect rhombohedra were noticed. The alteration to leucoxene is very characteristic, this resulting form of sphene frequently exhibiting its characteristic brilliant chromatic polarization in thin sections. (1) Besides these larger fragments small rounded grains of a brownish grey translucent mineral occur with high index of refraction, and show brilliant interference colours. These occasionally show small granules in the centre of unaltered titanic iron ore, and thus reveal their derivation. Apatite is very abundant, and occurs in colourless prismatic needles which are frequently bent, cracked and broken. Pyrite is also a rather abundant accessory constituent.

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(1) Williams' Appendix I., Part F., Annual Report, Geological Survey of Canada, Vol. V., 1889-90, p. 60.

(2) Reference No. 4, p. 3c, Bk. II. Low, 23/6/94.

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(1) Page 16 A, Report Geological Survey of Canada, 1880-2.

HUNTING THE BARREN GROUND CARIBOU.

By **FRANK RUSSELL**, of the State University of Iowa.

Vague rumors had reached Fort Rae concerning the whereabouts of the "deer" during the last week of October, but it was not until the first of November that a party left the post to hunt them.

A few years ago the Barren Ground Caribou appeared about the fort regularly upon All Saints Day. They were often killed from the buildings, and throughout the winter might be found near the post. In 1877 an unbroken line of caribou crossed the frozen lake near the fort, they were fourteen days in passing and in such a mass that, in the words of an eye witness, "daylight could not be seen" through the column. They are now seldom seen within several miles of Rae.

The "Fort Hunter," Tenony, with seven of his followers was just starting upon a seventy-five mile journey toward the north on the evening of the first, when I learned of his intentions, and after agreeing to furnish a few "skins" of flour, tea, and tobacco, and to pay a skin a day for a dog driver it was settled that I might accompany them into the hunting grounds where another chief, Naohmby, had objected to my going three months before, on the ground that all the game would desert the country if pursued by a naturalist.

I loaded my sled with thirty white fish, three days provisions for the dogs, and fifteen pounds of "dry meat" for the "boy," while I shared alternately with each of them during the trip, the rank, "hung fish" driving me to dried meat and the leathery slabs compelling me to return to the fish.

As the "brigade" only intended getting clear of the fort that evening I preferred to remain and make an early start the next day. We left the fort at daylight on the second, Yahty running before my dogs. Our course was northward for twelve miles, to the end of the Northern Arm of the Great Slave Lake, whence a channel a hundred yards in width called Willow River continues for half a mile before expanding into a small lake extending toward the northeast and connecting by a number of "schnys" with Lac Brochet. Following the eastern shore of the small lake, we crossed a short portage and traversing a narrow channel for a couple of miles reached Sah-kah-tohn-tooh, the Lake of the Bear's Shoulder. This body of water must exceed twenty-five miles in length.

We did not succeed in overtaking Tenony but encamped near the end of the lake with an Indian, who, with his ten year old son and three miserable "giddies"—Indian dogs—was also in quest of the caribou. He carried a powder horn differing from any that I saw in the North. It was made by boring or burning out a section of the bram of a caribou's antler. He would smilingly beg for tea and tobacco, not becoming in the least disheartened by repeated refusals. I was glad to escape his importunities by leaving camp at 4 a.m. The brisk trot of our well-fed team soon carried us out of reach of the yells of the giddies as the lash was unsparingly applied in his efforts to keep up with the "Mollah" who had such quantities of "lee tea" and "tobah."

Passing a couple of miles of short portages we reached another large lake called by the Dog Ribs, Quem-tah-Tooh, the Lake of the White Rock, where we found Tenony encamped.

The Indians had been aroused by their dogs greeting our approach with barks and howls and were huddled behind a roaring fire with their blankets, once white, now a dirty gray, thrown over their shoulders, their hands outstretched toward the welcome blaze while they guarded the few frozen fish which were thawing and burning at their feet. Behind them a confused mass of dog harness, wrappers, and flat sleds formed a barrier to keep out a score or more of giddies which were crowding about the camp and fighting for an advantageous position from which to watch for the few bones that escaped their master's teeth. After "drinking tea" we followed the lake shore toward the northwest where a range of granite hills, called Sah-me-t' ie-kfwa, rose high above the general level of the somewhat rugged country about them.

When close to the hills we discovered a small band of caribou toward which the dogs started at their best pace, barking and straining at their collars, and urged to greater exertion by the men who shouted "Ayee ecwoh, m'nitla" (There are the caribou, now, go!). The alarmed caribou were dashing about in all directions yet managing to keep out of range though several shots were fired before they entered the timber. Around us rose the precipitous snow covered mountains through a gap of which a large stream entered the lake, its cascades giving off clouds of vapor. High above us a bald eagle wheeled in majestic flight with white head and crissum flashing in the light of the rising sun. Cutting our way through a brulé we reached another lake upon which there was an abundance of fresh tracks. An hour later I left the others and started down the lake with the boy before the dogs. Three or four bands of caribou, perhaps fifty in all, soon came out upon the ice. Yahty ran toward the nearest of them followed by the dogs which dashed past him at full cry as soon as they discovered the caribou. I was seated upon tne sled while Yahty ran, holding the sled line in a cloud of snow which trailed out behind like the tail of a comet.

The caribou stood motionless until we were within a couple of hundred yards before making off; they soon stopped, side on, to survey their pursuers, snuffing the air for a moment ; they would throw back their heads and leap high in the air, and again dash away at a swift run, passing patches of smooth ice without a miss step.

The drifts were small, but the snow was well hardened making a rough surface for the swift flying sled. Just as I would be about to pull the trigger after taking hasty aim a sudden lurch would nearly dislodge me from my seat and perhaps send the muzzle of the rifle skywards. I succeeded in killing two and breaking a fore leg of another which ran with undiminished speed, in fact led the band as they entered the timber and so escaped.

Placing a row of pine boughs at intervals of fifteen or twenty yards quite across an arm of the lake we concealed ourselves on shore, and waited the appearance of the caribou. Only one band approached our barrier which they followed some distance, but did not venture to cross ; they turned away before coming within range, but the following day we were more successful in employing this, a common device of the Dog Ribs.

That evening we feasted until a late hour upon the first caribou meat of the season. Several heads were skinned and hung from poles before the fire by the mitten cords of the owners and willow hooks. As soon as the outside was roasted the jaw was turned back and the tongue, one of the choicest bits of all, slightly cooked. The dogs were well fed for the first time in months; we gave them the quarters only, and cracked the long bones for the marrow which, raw or roasted, is one of the greatest of Dog Rib luxuries. Look down in pity upon "the savage and his marrow bones" if you will, but you might perhaps relish that same marrow if you had "hustled" for those bones yourself as I had done, or you might after running fifty miles pass your plate a second time for bouillon made of blood carried to camp in a caribou's stomach. Even the tendons were eaten and the feet also, after roasting them until the hoof could be knocked off.

Although I lived some time with the Dog Ribs and spent over a year in their territory, I never knew of their eating the contents of the caribou's stomach as do the Eskimos. The unborn calf, the udder of a milk-giving cow, the tongue, the marrow and back fat are the parts held in highest esteem.

Tenony fulfilled his promise of returning after "five sleeps," but marched fifty miles against a heavy gale of wind upon the sixth day to do it.

The caribou came but little nearer during the winter of 1893-84. I made three other trips in search of them and travelled five hundred miles in all, driving my own dogs after the first hunt with Tenony. Out of a large number secured, I selected eight choice specimens, and during the winter obtained the skin of an albino, for the museum of the State University of Iowa. Albinism is of rare occurrence among the Barren Ground Caribou. One of the oldest Dog Ribs assured me that he had never seen a "white deer."

Authorities differ as to the time when the antlers are cast.

The new horn begins to grow late in April and the velvet is not all cleared off until November. The old males shed their antlers in December. While in the Barren Ground in March and April, I saw large numbers of both sexes with antlers, and on the 5th of April I killed a buck, four or five years of age, still bearing them. At that season we saw thousands of caribou in the vicinity of Bathurst Inlet, which had evidently wintered there and not approached the woods as in former years.

It is said that only the females reach the sea coast where they drop their young in June. Yet I have seen both male and female caribou wading in the shoal water of the Arctic Ocean south of Herschel Island in July.

TOWN BIRDS.

By W. A. D. LEES.

(*Read before the Ottawa Field Naturalist's Club, 14th March, 1895.*)

After a year or two with little opportunity to be in the woods or on the waters where birds are most commonly found, one has not much to report of their doings, and hence I am constrained to-night to confine my remarks to "Town Birds." Everyone of us may see something of these as he goes about the city on his daily business, and to one who has not given the subject much attention it is astonishing what a number of species are found even in the busiest streets.

For the student of birds, as well as for those who have only a very casual acquaintance with them, there is always something new in store, even among the town birds. Seven years ago yesterday, near the corner of Maria and Metcalfe streets when I was only beginning, as they say with children, to " take notice " of birds, I came upon a flock of Purple Finches (I think the other name of Red Linnet, is a better one) and was thrilled by the brilliant colour of their plumage, which to my unpractised eye seemed as if stained by the rowan berries upon which they were feeding. Less than a month ago, at the same street corner, I saw my first flock of those erratic winter visitants the Bohemian Waxwings, and I do not think that either the lapse of years, or the number of birds I have come to know since those first red linnets, in any degree lessened the thrill of pleasure with which I welcomed another new acquaintance to the list of my bird friends.

The rowan trees along the streets and in public and private grounds, when in fruit, give us many opportunities of seeing birds which, like these Waxwings, visit us from the far north. Most of you will remember how, some ten years ago, the Pine Grosbeaks came down in such numbers, and were so apparently indifferent to the presence of man, that they might almost be taken by hand as they fed upon the berries dropped by their hungry comrades in the trees, upon the snow beneath.

Almost every neglected vacant lot with its crop of weed seeds attracts in due time its roving flock of Redpolls, or their near relatives the Goldfinches, for these latter often spend the winter with us, escaping, in their sober garb of olive brown, the observation of those who only know them in the brilliant black and gold of Summer. Pine Siskins too may be looked for whenever and wherever the white cedars have cones, in the seeds of which they seem especially to delight, and wherever such small game abounds, one has not far to seek their handsome and voluble but deceitful enemy the Shrike. Hawks too are more or less common according to the food supply, and my note-book gives me both winter and summer records of the Sparrow Hawk in the busiest parts of the city.

A hawk was captured alive last fall at the City Hall square, and kept some time in confinement, but proving an undesirable pet, it passed from one owner to another and at last made its escape. I did not ascertain its species, but a remarkably tall legend connected with its final disappearance might readily suggest the possibility of its having been a Fish-hawk.

Even such a man-hater as the Ruffed Grouse, or as we commonly, but I believe incorrectly, call him, the Partridge, occasionally pays the city a visit, and has been known to fly through the glass of a window and land on the dining room table, a place to which, under the stringency of the present game laws, he usually finds his way by a less direct route, and, I might add, under a different name from either of the above.

Turning now to the summer birds, many are almost too common to need mention : such, for instance as the omnivorous and belligerent House Sparrow, for whom the name English, or even European, is now more of a misnomer than ever, since he has annexed the whole American continent. The Robin and the Song Sparrow may be heard and seen in all parts of the city, and the Night Hawk and Chimney Swift, in their season, are familiar objects to all who even glance upward. One of the former seated on a flat roof forms the subject of a very good photograph, edited (if I may use the term) by one of our members, who was quick enough to take advantage of the situation from the back window of a Sparks Street studio. Tree Swallows and Purple Martins are only a little less common, both species being regular summer boarders at the Albion Hotel, which has long since ceased to entertain other guests than these occupants of its sky parlors. Many a period of enforced waitting in an unattractive court room across the street has been pleasantly relieved by these same birds. From the windows of the same building I have often caught other little glimpses of bird-life without, which were in pleasing contrast with the glimpses of man-life to be had within. Here I have seen amongst others, Chipping Sparrows, Yellow Warblers, Warbling Vireos, Downy Woodpeckers, and Cedar Waxwings; a pair of the last industriously ridding the ash trees of caterpillars, and so close that I could easily distinguish the red wax-like appendages to the wing-tips, from which the bird takes it name. These birds are in due season also industrious fly-catchers, working in exactly the same way as the true *Tyrannidæ,* and so it is a question if, after all, they do not earn a right to at least some of the fruit they so greedily consume.

Amongst other birds more or less common in busy parts of the city may be named Bluebirds, Vesper Sparrows, and Savanna Sparrows, and even that handsome Woodpecker, from whose thirty or more names the American Ornithologist's Union has chosen "Flicker," appears in my note-book as a town bird.

That surprises are often in store for the observer of town birds is shown by such records as those of a Brown Creeper climbing a telegraph pole at the corner of Elgin and Queen streets, a Red-breasted Nuthatch on another telegraph pole at the corner of Elgin and Nepean streets, and a Wood Peewee in the back-yard of a Sparks street hardware store.

It will be noticed that in the above paper I have made no mention of the various small patches of wood-land in outlying parts of the city, such as those about Patterson's Creek, the old race-course, McKay's bush, and the like, where nine-tenths of all the birds that visit the district may be noted by a careful observer, while the Lovers' Walk and Major's Hill Park, in the very heart of the city will furnish records of many of the rarest and most retiring of our wood-birds. Neither have I mentioned another favorite haunt of the birds on Sussex street where the very shyest of them are so tame that they never leave their perches, even on the nearest approach of man. I mean the Geological Survey Museum.

JAMES DWIGHT DANA.

James Dwight Dana, one of the fathers of American Geological Science, died at his home in New Haven, Conn., Easter Sunday, the 14th day of April, 1895. He was born at Utica, N.Y., February 12th, 1813, and was therefore in his 83rd year. He graduated at Yale when only twenty years of age, and evinced great aptitude for the natural sciences and mathematics. For two years he was teacher of mathematics in the U.S. Navy. He is next seen as assistant to Prof. Silliman at Yale College. In 1838 he published "A System of Mineralogy," which won for him the admiration of the scientists of two continents as mineralogist and geoloist. In 1838, he sailed for the Southern and Pacific Oceans, with Lieut. Wilkes, in charge of the squadron, whose expedition lasted four years. "*A Report on Crustacea*," 1852-4. "*Report on Zoophytes*," 1846; "*Report on the Geology of the Pacific*, 1849; besides "*Science and the Bible*," in Bibliotheca Sacra, published in 1856-7, occupied his time during the 15 years which followed his return from the Wilkes expedition. In 1885 Dana succeeded Prof. Silliman as Prof. of Natural History and Geology at Yale. His first "Manual of Geology" was published in 1863—this was followed by a "Text Book of Geology for Schools and Academies," 1864, and latterly "Corals and Coral Islands" in 1872. In this year he was awarded the *Wollaston* gold medal by the Geological Society of London. He was elected President of the American Association Adv. Science for the first time in 1854, and was an honorary, corresponding or active fellow of nearly all the Geological Societies of Europe und America. His contributions and numerous writings in Silliman's Journal as one of its editors, in the Trans. Acad. Nat. Sc. of Philadelphia, in the Proc. Amer. Acad. Sc. and Arts and in numerous other channels are too well known to be commented upon in a passing sketch like this. He had just completed the last edition of his "Manual of Geology" which had been used so extensively as a text book in the colleges and universities of America and Europe. His was a life of genuine usefulness to his generation.

NOTES, REVIEWS, AND COMMENTS.

Geology.—BAILEY, PROF. L. W., M.A., Ph. D., F.R.S.C.—"*Preliminary Report on Geological investigations in south-western Nova Scotia.*" Being Report Q. of Vol. VI., Annual Report, Geological Survey of Canada, 1892-93, published 1895, 21 pp.

Pending the publication of Dr. Bailey's final report addressed to the Director of the Geological Survey of Canada, the preliminary report here referred to has been published and forms part of the 6th Annual Report of the Geological Survey. The delineation of the **granite areas** in South-Western Nova Scotia, the South and Blue Mountains, Tusket Wedge, the Barrington area, the Shelbourne and Port Mouton areas are given and the reader is referred to **Sir Archibald Geikie's** descriptions of South-Eastern Ireland as applying, almost word for word, to the granites of South-Western Nova Scotia. The **Cambrian Succession**, as seen in Queen's Co., is carefully described and the possible existence of pre-Cambrian rocks pointed out. As to the **Devonian System** our knowledge was still incomplete. On pp. 14 and 15, a brief summary of the palæontological results obtained by Dr. Ami after examining the collections in the Peter Redpath Museum and in the possesion of the Geological Survey is given. Most of the collections from Nictau point to **Eo-Devonian** time. The **Triassic** and **Post-Tertiary** system are next discussed, and the economic minerals receive considerable attention.

MATTHEW, G. F., Dr., M.A., F.R.S.C., "*Early Protozoa,*" "The American Geologist"—Vol. XV., No. 3, pp. 146-153, March, 1895.

In this paper the author reviews Mr. L. Cayeux's paper describing certain so called Pre-Cambrian Radiolaria. No less than 45 different kinds of rhizopods have been described and are figured on one plate.

Mr. Cayeux's microscopic slides were examined both by Dr. G. J. Hinde, of London, England, and by Dr. Rüst, of Hanover, Germany. These two gentlemen, whilst not agreeing with his (Cayeux's) conclusions, admitted that the forms were organic."

WINCHELL, W. H., PROF.—"*The Stratigraphic base of the Taconic or Lower Cambrian.*"—"The American Geologist," Vol. XV., No. 3, pp. 153-162, March, 1895.

This contains a general sketch of the history of geological investigations, both in Great Britain and America, regarding the base of the fossiliferous series—of the lower Cambrian. The views held by Sedgwick, Murchison, Dr. Hicks, by Barrande in Bohemia by Sir Archibald Geikie are freely quoted—whilst in America those of Dana, Logan, Walcott, Selwyn, Ells, Van Hise and others are also cited. Director Howley's work in Newfoundland is likewise referred to, as well as Dr. Matthew's researches in New Brunswick.

TAYLOR, FRANK B.—"*The Second Lake Algonquin.*" The American Geologist, Vol. XV., No. 3, pp. 162-179, March, 1895.

This contains the concluding article by Mr. Taylor on the above subject as elaborated from data obtained in the North Bay and surrounding district around Lake Nipissing in Canada.

"The attitude of the deformed plane;" the order of changes in Niagara and Lake Algonquin, the St. Clair Flats, evidence of recent elevation and tilting in contiguous regions--all are elaborately discussed. Mr. Taylor sums up his conclusions regarding the rise and fall of the waters in the straits and lake of Nipissing—of Superior and Lake Erie. The suggestive facts mentioned point," naturally, "to a correlation with the eastward uplift which deformed the Nipissing plane with the elevation of the north-eastern barrier of Lake Ontario and of the deposits of the Champlain submergence, in the Champlain, Lower St. Lawrence, and Hudson Bay areas.

GIRTY, GEO. H.—*Development of the corallum of Favosites Forbisi, Var. occidentals.*"—The American Geologist, Vol. XV., No. 3, pp. 131-146, March, 1895.

Mr. Girty, who has carried on his researches at Yale, under Dr. C. E. Beecher, describes *five* stages in the growth of the corallum of the above species. He carefully describes the interstilial cells or buds which can appear only when divergence of the older corallites permits—usually "in the angles where the older corallites meet."

Favosites spinigeurs, Hall, and *F. conicus*, Hall, both Silurian corals, have also received attention and study for comparison, likewise *F. hemisphericus*. Mr. Girty observes the noticeable fact that the initial corallite in Favosites gives rise to buds which are (1) *four* in number, and (2) all on one side (dorsal) of the corallum. *Favosites* presents an interesting form for the study of mural pores and their relations. The affinities of this genus are likewise discussed and seem to point to Aulopora and Romingeria—rather than any other genera of the *perforata* excepting Michelinia and Pleurodictyum. The first stage of Pleurodictyum and of Favosites is an auloporoid stage represented by the initial cell.

Geology of Aylmer—On the 27th of March, 1895, one of our members, Mr. T. W. E. Sowter, delivered a lecture on the "**Palæontology** and **Geology** of **Aylmer** at the Academy. The lecture proved to be very interesting and was illustrated by a large suite of specimens consisting of rocks and fossils, some new to science. We are pleased to state that we expect to receive a paper from Mr. Sowter on the above subject for the pages of the NATURALIST in the near future.

Zoology—*Tunicata of the Pacific Coast of North America.*

1. Perophora annectens, n. sp. By WILLIAM E. RITTER. Proc. Cal. Acad. Sc., Vol. IV, Part I, pp. 36-85, Plates I. II. and III., figs. 1-39. Sept., 1894.

This is an interesting and exhaustive biological study of one of those interesting species of tunicates which abound along the rocky coasts and shores of the North American Pacific. The species here described for the first time is from Monterey Bay, California. The author gives first a general summary of our knowledge of simple and compound ascidians, and points out that with the result of his researches, the importence of this old classification becomes "*nil.*"

Perophora Hutchinsoni, from Australia, and *P. viridis* from the New England coast of North America are the latest forms brought under Wiegmann's genus established in 1835. Then follows a diagnosis of the species with a general description dealing with the mode of occurrence of the ascidiczooids in their colonies. Their histological characters are very ably described. This form is a particularly favorable one to study owing to its wonderful transparency. The *test* and the origin of its cells receives special attention. The results of Ritter's work confirm those of Salensky and Kowalevsky on the same subject, showing that the cells of the tunicate test are not derived from the ectoderm but from the mesoderm. Dr. Ritter says: "I believe this to be due to the fact that the cellulose substance of the test is here being formed.. I have no evidence that the matrix or cellulose portion of the test is produced as a secretion of the mesodermal cells imbedded in it......

Selensky also regards the processes present as having to do with the formation of the cellulose substance."

The musculature, the pharyngeal apparatus, interesting notes on the parasites of the tentacles, the branchial basket proper, the endostyle, the sub-neural gland, the digestive tract and its parasites, each received a share of careful description. Then the reproductive and circulatory systems are discussed. The movements of the heart and the character of the blood cells are also noted, some new light being thrown on the latter although Roule has arrived at very similar results from his researches on the simple ascidians from the Coast of Provence, France. Three plates accompanying the paper. The figures were nearly all outlined by the author with the aid of an Abbé camera lucida.—H. M. AMI.

Zoology—VERRILL, A. E.—*Distribution of the Echinoderms of North-eastern America.*—Amer. J. Sc. & Arts, Vol. XLIX, 3rd Ser., No. 290, pp. 127-140, February, 1895,. also *ibid*, No. 291, pp. 199-212, March, 1895, New Haven, Conn.

The following species of Echinodermata from Canada and other British possessions in North America are recorded in these interesting papers by Prof. Verrill.

ASTERIOIDEA.

No.	Genera & Species.	Author.	Locality.	Remarks.
1	Pontaster hebitus..	Sladen.	Nova Scotia and Newfoundland...........	Banks off the coast.
2	Pseudarchaster intermadius.... ..	Sladen.	Nova Scotia...........	A circum—polar species.
3	Ctenodiscus crispatus............	Dub. and Koren	Bay of Fundy..........	
4	Psilaster Floreæ .	Verrill......	Banks off Nova Scotia..	Taken by Gloucester fishermen.
5	Pentagonaster granularis	Perrier.	Banks off Nova Scotia..	Taken by Gloucester fishermen.
6	Hippasteria phrygiana..	Agassiz.....	Bay of Fundy, Nova Scotia.	On hard bottoms.
7	Tremaster mirabilis	Verrill......	Banks off Nova Scotia, and Newfoundland...	
8	Solaster endeca....	Forbes......	Bay of Fundy, banks off Nova Scotia........	In 40 to 150 fathoms.

ASTEROIDEA—*Continued.*

No.	Genera & Species.	Author.	Locality.	Remarks.
9	Solaster Syrtensis	Verrill	Banquereau, Nova Scotia	45 to 80 fathoms.
10	Solaster Earllii (allied to S. Dawsoni Ver. from coast of Brit. Col.	Verrill	Banks off Nova Scotia and Newfoundland	From 170 to 300 fathoms.
11	Cros aster papposus	Müll and Troschel	Bay of Fundy, Newfoundland	An arctic species.
12	Pteraster pulvillus.	M. Sars	Bay of Fundy, banks off Nova Scotia and Newfoundland	
13	Pteraster militaris	Müll and Troschel	Bay of Fundy	Common, 10 to 50 fathoms.
14	Cribrella pectinata	Verrill	Bay of Fundy	Shallow water.
15	Cribrella sanguinolenta	Lütken	All along the eastern coast	On hard bottoms, ranges to Greenland.
16	Pedicellaster typicus	M. Sars	Gulf of St. Lawrence	Ranges to the Arctic Ocean.
17	Stichaster albulus	Verrill	Bay of Fundy, and off coast of Nova Scotia	Common, ranges to Greenland.
18	Asterias vulgaris	Stimpson MSS	Bay of Fundy, Labrador.	Belongs to the cold areas.
19	Asterias stellionura	Perrier	Banks off Nova Scotia	40 to 300 fathoms.
20	Asterias enopla (a new species)	Verrill	Off Nova Scotia	53 to 100 fathoms.
21	Asterias polaris	Verrill	Anticosti, Gulf of St. Lawrence, Labrador	Large and abundant on she Labrador coast.
22	Leptasterias tenera.	Verrill	Bay of Fundy, Newfoundland	Possibly L. Compta
23	Leptasterias Groënlandica	Verrill	Gulf of St. Lawrence, Bay of Fundy	Ranges to the Artic Ocean.
24	Leptasterias littoralis	Verrill	Coast of Nova Scotia, Gulf of St. Lawrence	
25	Hydrasterias ophiodon	Sladen	Off Halifax	Collected in 1,250 fathoms by the "Challenger."
26	Odinia Americana.	Verrill	Banquereau, Nova Scotia	Attains a great size.

H. M. A.

CLUB NOTES.

Annual Meeting—At the Annual Meeting of the Ottawa Field Naturalists' Club held on Tuesday, March 19th, 1895, the following members were present: Dr. G. M. Dawson, C.M.G., F.R.S., president, in the chair; Dr. R. W. Ells, Messrs. R. B. Whyte, W. Hague Harrington, T. C. Weston, A. G. Kingston, Walter R. Billings, T. J. MacLaughlin, Frank T. Shutt, D. B Dowling, Maurice Panet, R. H. Campbell, Andrew Halkett and H. M. Ami.

The Sixteenth Annual Report of Council for 1894-95, was read by the Secretary, Dr. Ami, and showed that the Club was in a flourishing condition.* The following were then elected members of the council for 1895-96, to which is added the name of the patron of the club, the standing committees of Council and leaders.

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THE RT. HONOURABLE THE EARL OF ABERDEEN,
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(Geol. Survey Dept.)

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Mr. W. F. Ferrier, B.A.Sc., F.G.S.
Miss A. Shenick, B. Sc.
" G. Harmer.
" A. M. Living.

Standing Committees of Council:

Publishing: Dr. Ami, Prof. Prince, Mr. Dowling, Mr. Kingston, Mr. Ferrier.
Excursions: Mr. Kingston, Mr. Dowling, Dr. Ami, Miss Shenick, Miss Living.
Soirees: Prof. Prince, Mr. Sinclair, Mr. Fletcher, Mr. Halkett.

Leaders:

Geology: Dr. Ells, Mr. Ferrier, Dr. Ami.
Botany: Mr. Whyte, Prof. Macoun, Mr. Craig.
Entomology: Mr. Fletcher, Mr. Harrington, Mr. MacLaughlin.
Conchology: Mr. Latchford, Mr. Halkett, Mr. O'Brien.
Ornithology: Mr. Kingston, Miss Harmer, Mr. Lees.
Zoology: Prof. Prince, Mr. Whiteaves, Mr. Small.

Excursions—The Excursion Committee and Council of the Club have before them an interesting series of excursions for the summer. The first general and spring excursion of the Club is to take place on the afternoon of **Saturday**, the **18th** of May, when **Chelsea**, on the outskirts of the Laurentide Hills, will be visited. It is needless to describe the attractive features of the locality. Leaders in Botany, Geology, Entomology, Ornithology etc., will be present and a profitable as well as an enjoyable time is expected. The excursion (special) train will leave the **C.P.R.** (Union) **Station,** Ottawa, at **1.30** p.m., returning, leave Chelsea at **6.30** p.m. Full round trip **tickets** can be obtained from members of the Excursion Committee or of Council at the station or previously—at the following rates :

---

*Full report published in the April number of the Ottawa Naturalist, pp. 15 to 18.

Members - - - - -	30 cents.
Non-members - - - - -	40 "
Children - - -	half price.

Sub-excursions—At a joint meeting of the Council and Leaders of the Ottawa Field Naturalists' Club, held in the Normal School, 26th April, 1895, it was unanimously agreed "That sub-excursions be arranged for Saturday afternoons, as in former years. Sub-excursion parties will assemble at the **City Post Office** beginning Saturday, **May 4th,** at **2.15 p.m.** sharp—where leaders in different branches of the Club's work will be in attendance. Interesting localities within easy reach of the electric car system will be visited, and special opportunities afforded to those who desire to study the **flora** and **fauna** of Ottawa and its environs.

Fees—The new Treasurer elect, Mr. D. B. Dowling, Geological Survey Department, Ottawa, calls the attention of the members of the Club to the date which he has taken the trouble to place on the address slips informing each member of the time of expiring of his or her subscription. As the **Naturalist** cannot be published without funds, a prompt payment of the fees now due by members of the Club, will enable the publishing committee to carry on its work with greater facility and success. Membership fee, comprising subscription to **Ottawa Naturalist**, only **one dollar**.

The Ottawa District—For purposes of Natural History and for more exactly defining the limits of the phrase "Ottawa District," it was unanimously agreed at the last Council meeting of the Ottawa Field Naturalists' Club to limit the territory included, to that which is comprised within a circle whose centre is **Ottawa,** with a radius of **thirty miles.**

Meteorological Observations—The members of the Ottawa Field Naturalists' Club are particularly indebted to Mr. R. F. Stupart, the new Superintendent of the Dominion Meteorological Service at Toronto, for a most valuable abstract of observations which we publish in this number of the NATURALIST.

Ottawa Camera Club—At the first meeting of the Council of the Ottawa Field Naturalists' Club, held since the annual meeting, it was unanimously agreed to extend an invitation to the members of the OTTAWA CAMERA CLUB to attend our excursions at reduced members' rates.

Frequency of the Different Winds from Observations at 7 a.m., 2 and 9 p.m., Ottawa, 1894.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
January	7	9	23	0	3	5	22	8	16
February	2	3	17	0	8	12	12	10	20
March	6	6	14	5	6	13	23	9	11
April	9	8	12	5	11	9	16	5	15
May	8	9	13	7	15	10	9	10	12
June	3	3	8	3	11	21	24	8	9
July	4	4	4	3	13	21	16	5	23
August	17	6	7	6	8	15	8	12	14
September.....	1	4	12	7	11	10	16	6	23
October	1	8	20	7	9	15	20	5	8
November	7	4	17	4	8	11	24	10	5
December	5	3	23	2	8	16	16	12	8
Year........ .	70	67	170	49	111	158	206	100	164

Heaviest snow storm of year, 29th January. Amount, 22 inches.
Coldest day of year, 24th February. Mean Temp., 13.85.
Last snow, 24th March.
First thunder storm, 4th April.
Last Frost, 15th April.
Heaviest rain storm of year, 20th June. Amount, 1.64 inches.
Warmest day, 19th July. Mean Temp., 77.80.
First frost of season, 26th September. Thermometer, 29.5.
First snow of season, 14th October. Not measurable.
Last thunder storm, 16th October.
First measurable snow, 5th November. Amount, 1.5 inches.
First record below zero, 26th December.

burning on the high rocky shore at Lapoté's Point, to deceive their wily enemies, the little band of intrepid Frenchmen traversed the forest to the east of the bay, forded Constance Creek, passed beneath the shadow of the pine groves on the sand hills to the north of the bay and fell suddenly on the Indian camp on Sand Point. The encounter was sharp and terrific and resulted in the utter defeat and route of the Indians.

Wm. Baillie, of Aylmer, informed the writer that a great many bones are scattered over this point; and Mr. Montgomery, who recently lived in the vicinity, stated that his two sons discovered, at this place, an almost perfect human skeleton. Mr. Baillie also states that some years ago, on the eastern shore of the bay, a number of copper kettles, of ancient design, were unearthed. These facts would seem to corroborate, to some extent, the above tradition and invite a closer investigation of the subject. The weird Indian legends of prolonged conflicts with Wendigoes, supposed to have inhabited the sand dunes of Sand Point, should also be collected before the generation of old men, now retaining them, have passed away.

The old Indian portage at the Chats should also be a point of great interest to the archæologist. The remains of old bullets, badly decayed, have been found by the writer in the crevices of the rocks at this place, strongly suggestive of the times when these "carrying places" were disputed, foot by foot, by hostile war parties. An old copper coin and other ancient works of art, found on the lake shore at Aylmer, as well as an iron tomahawk of peculiar design discovered by S. H. Edey some two miles inland from this place, are matters of interest.

Finally, I might say that members of the Field Naturalists' Club who wish to make a careful examination of places alluded to in the above will soon be in a position to do so. Capt. Davis will shortly have a steamboat running between Britannia and the Quyon, which will enable us to make any of these places the objective point of an excursion of the club. Traditions and folk-lore stories associated with Lake Deschenes should then be collected and recorded before the hand of time has placed them beyond our reach.

T. W. EDWIN SOWTER.

Aylmer, Que.,
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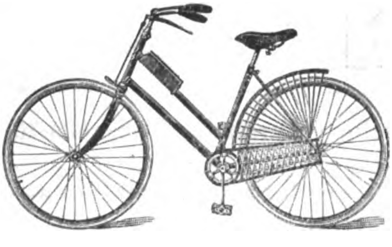

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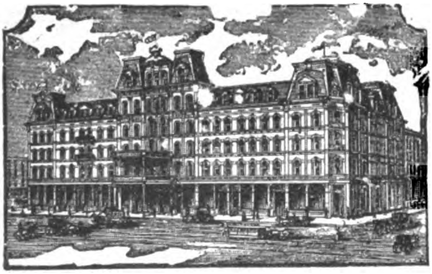

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General Excursion of the O. F. N. C. will take place on Saturday, 14th inst., to Paugan Falls, Gatineau Valley. Union Depot, 9.45 a.m., (see page 131.)

U HOLZER